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DERWENT WHITTLESEY, *Editor*

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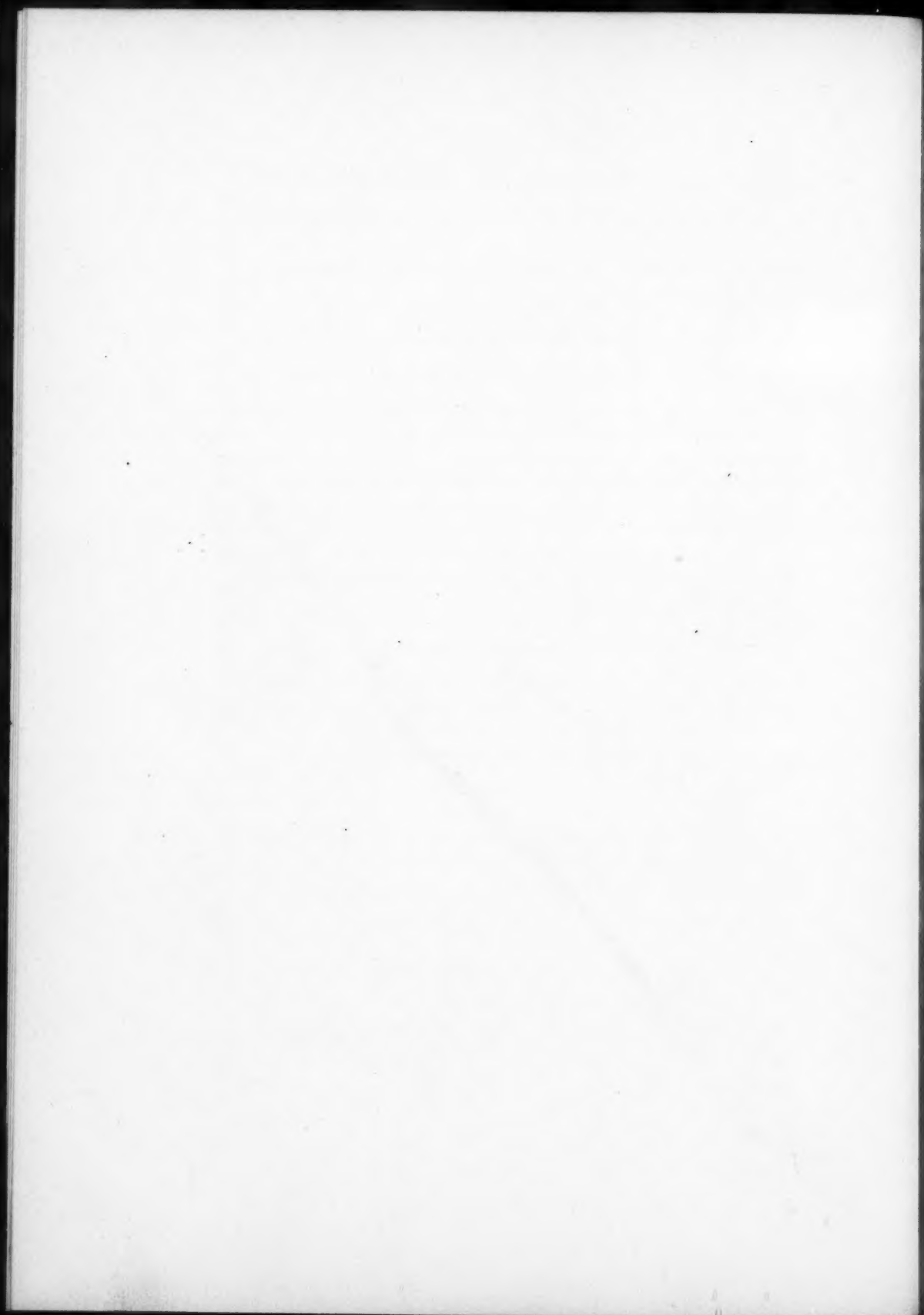
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No. 1

San Fernando—A Type of Southern
California Town

CLIFFORD M. ZIERER

The Los Angeles basin contains the largest population of any district of its size in the western half of the United States. Urbanization is its dominant developmental characteristic. It is proposed here to describe and interpret geographically a town which is representative of many of the smaller urban communities in the Los Angeles basin. It may be portrayed as a semi-rural market and residence center which derives much of its character from a strategic geographic location with respect to an important mountain pass, from its position upon an intensively cultivated piedmont slope, and from close proximity to a large metropolis.

URBAN SETTING AND CHARACTERISTICS

San Fernando, with a population of 7,500, is situated like an island within the northwest *political* limits of Los Angeles. Intensively developed farm lands and some waste lands extend beyond the town on all sides for distances of several miles. No far-flung zones of urban development connect it with "downtown" Los Angeles (23 miles distant) although such associations are being established through the growth of towns along the principal railroads and highways connecting the two centers. San Fernando lies just beyond the limits of the practicable commuting zone about Los Angeles, and, therefore, its population is dependent almost entirely for its

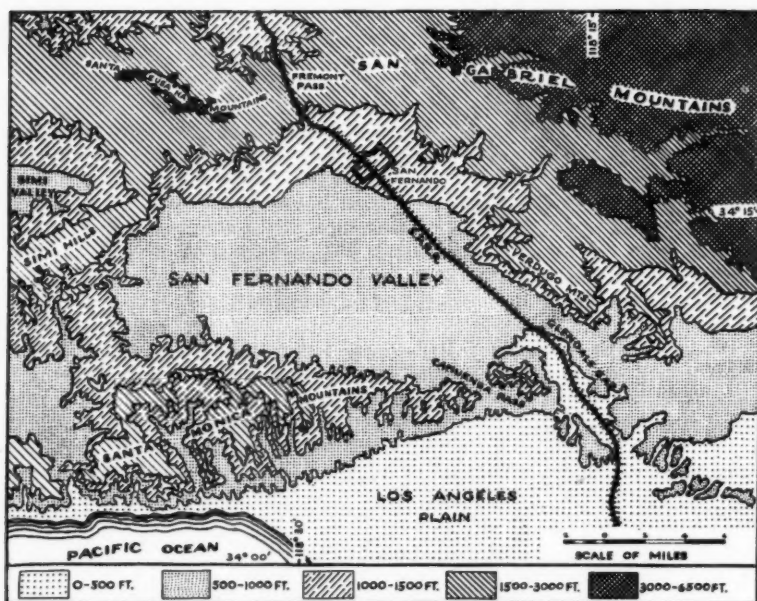


FIG. 1.—The town of San Fernando in relation to the surrounding major physiographic features. Mountain ranges with heights of 1,500–3,000 feet practically inclose the basin commonly known as San Fernando Valley. The southern margin of the valley floor corresponds approximately with the 1,000-foot contour while the northern margin nearly coincides with the 1,500-foot contour. San Fernando occupies a middle position on the northern and higher slope of the valley.

livelihood upon the resources and activities of the immediate tributary area.¹

The town occupies a central and strategic position within the elevated, northern component of triangular San Fernando Valley (Fig. 1). Rugged

¹ In 1915, soon after the completion of the Owens River aqueduct, 170 square miles of territory were added to the city of Los Angeles, which already contained 115 square miles of area, in order to find a market for surplus water. Due to Federal restrictions water could be used only within the legal limits of Los Angeles or in other cities purchasing a supply. San Fernando Valley lay just to the north of Los Angeles and across the low Santa Monica Mountains. It was easily accessible through several passes and the valley was greatly in need of additional irrigation water, especially since Los Angeles had early established claim to both surface and underground waters of the entire basin. Except for San Fernando and several other incorporated towns having adequate water supplies of their own, the entire valley was annexed.

and brush-covered mountain lands, most of which are included in the Angeles National Forest, border the valley segment on the northerly sides within distances of two to four miles of the town. The mountains are not inhabited and they sharply limit the extent of the town's contiguous tributary area in that direction. The southerly limits of the tributary area are indefinite but they lie about four miles to the south or approximately half way to Van Nuys, the principal competitive valley market center. The latter boundary tends also to coincide with the thermal line below which subtropical fruits are not likely to succeed because of winter frost. Thus due to its location within the citrus belt San Fernando commands the trade of the most productive agricultural portion of the entire valley.

The trade of the western end of San Fernando Valley, where the population is much less dense and where agriculture is less intensive, tends to be shared nearly equally by San Fernando and Van Nuys because either center is readily accessible. San Fernando secures some business from persons living in the Upper Santa Clara River Valley, to the north of Fremont Pass, since no adequate market center has developed in that thinly settled district. Although portions are well defined it is thus seen that most of the boundaries of San Fernando's recognized commercial area tend to be zonal; in fact, the forces of outside competition penetrate in part to the very center of the district.

The San Fernando district is composed chiefly of the coalesced surfaces of numerous alluvial cones which have partially filled the northern end of San Fernando Valley.² Valley elevations range from 1,500 feet along the northern margin of the district to 800 feet on the south, the slope gradually flattening with increased distance from the mountains. The town is situated largely between the 1,025 and 1,175-foot contours on a nearly uniform slope of 75 feet per mile. Its middle position on a piedmont slope is representative of the sites of a score of towns lying along the southern margins of the San Gabriel and San Bernardino mountains. Many of the effects which will be described of such a site upon urban development in San Fernando are applicable in varying degrees to other piedmont towns.

Several small streams with very restricted mountain watersheds to the northwest of San Fernando and the much larger Pacoima and Tujunga creeks to the northeast have in the past poured flood waters loaded with sediment upon the alluvial slopes following winter rains (Fig. 2). The small streams have built long gentle slopes covered with medium-to-fine textured

² See the following contour maps of the United States Geological Survey: (a) Fernando (Calif.) sheet—scale 1:62500, surveyed in 1897; (b) Pacoima and Sylmar (Calif.) sheets—scale 1:24000, surveyed in 1924-25.

Flood damage has never been especially serious in San Fernando because it is situated on land slightly above that to the east and to the west. Storm waters from small streams directly above the town are now diverted by means of a large drainage ditch, built in 1912, and extending at right angles to the slope along the northern town boundary. Flood damage from Pacoima and Tujunga creeks has in the past been serious in parts of the valley but is now prevented by the presence of huge flood control dams in the canyons. Winter flood water is released from those reservoirs throughout the year and so slowly that it seeps into the loose valley fill as soon as the streams leave the narrow and rocky canyons. The water is later drawn from the underground reservoir through wells for domestic use in Los Angeles and for the irrigation of valley farms.

The broad, bouldery wash of Pacoima Creek borders the town directly on the east and presents a definite barrier to expansion in that direction. Every improved "east-west" street in the town, except the through highway paralleling the railroad, ends abruptly at the edge of the wash. Because of its barrier effect the wash tends to weaken San Fernando's commercial relationships with the small, disrupted agricultural areas lying to the east. Pacoima village, although not a serious competitor of San Fernando, performs certain commercial functions for that section, such as to provide food stores and plants for shipping fruits and vegetables.

The low San Fernando Hills (outliers of the Santa Susana Mountains to the northwest) approach the town on the west. They, with several small isolated hills a mile or more to the east tend to separate the northern end of San Fernando Valley from the major basin. The hills are responsible for the accumulation of important supplies of underground water in the valley fill to the north. They have also deflected slightly the routes of the railroad and highways, afforded sites for necessary reservoirs, and given some protection to fruit districts against destructive winds entering the valley from the north. The rounded hill slopes covered with compact residual soils are in places devoted to grain or hay production but in general they serve merely as low-grade pasture lands.

There are no topographic eminences within the town itself to attract exclusive residences and except for the bouldery channel of Pacoima Creek every acre of land within the town limits is about as desirable environmentally as another for urban uses. Residents in the northern portion of the town enjoy a slightly nearer and better view of the mountains but the view of the valley to the south is not very impressive from any part of San Fernando because of the long and gentle gradient of the piedmont slope.

No portion of the town site is much subject to the dense ground or radiation fogs which at times envelope the lower valley. Not infrequently in the

early morning hours automobiles creep cautiously along highways through the lower valley, and, suddenly emerging from the shallow fog layer, they enter the higher, sunny San Fernando district. Moderate elevation, abundant sunshine, and distinctly higher daytime temperatures than prevail along the coast are physical facts which have attracted many residents to that portion of the valley. Strong, dust-laden desert winds from the north at times, however, make life very unpleasant in San Fernando and they do considerable damage to crops.

Of utmost importance to San Fernando is its control of Fremont Pass (sometimes called San Fernando Pass), the only *used* gap leading from Los Angeles through the San Gabriel Mountains, where they are lowest and least wide, to the Mojave Basin and the San Joaquin Valley. The location of the town some three miles east of the pass does not lessen its command of the gap and greatly increases its tributary agricultural area.³

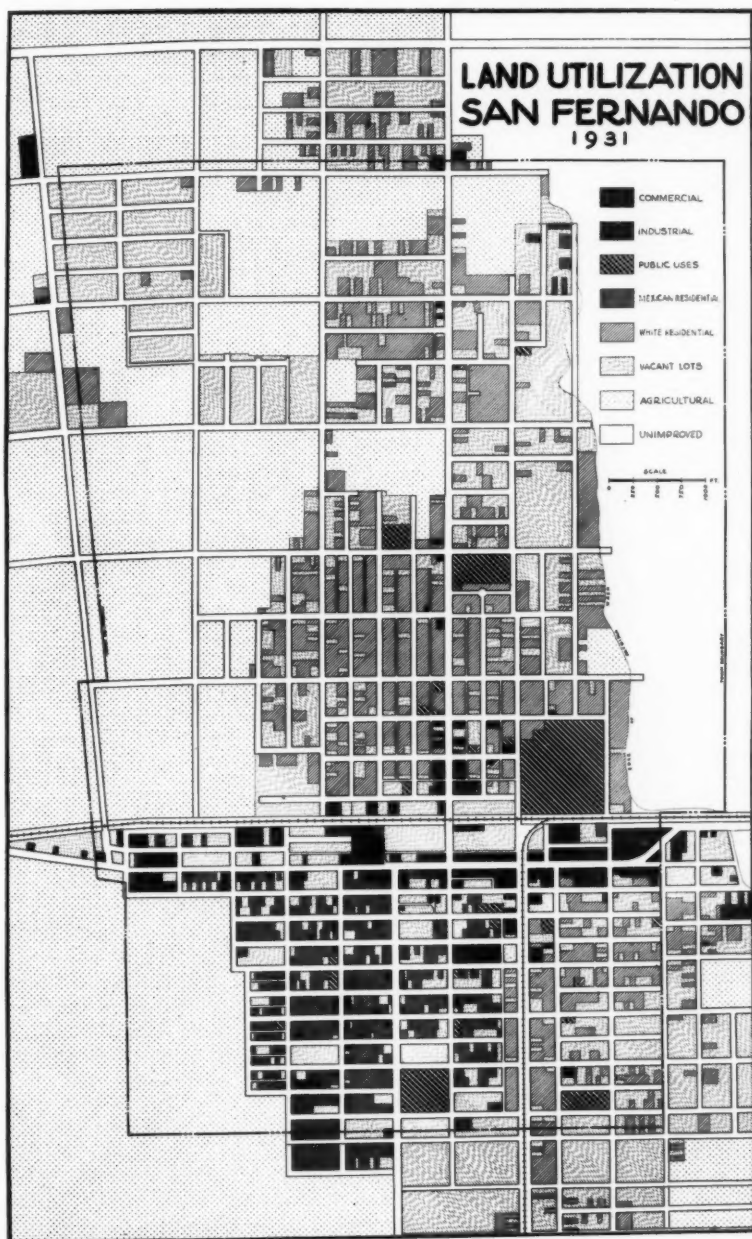
Fremont Pass consists of a broad notch having a width of about four miles, with an elevation of 1,800–2,000 feet, and lying at the juncture of the San Gabriel and Santa Susana mountains (Fig. 1). Within distances of two miles to the east and to the west of Fremont Pass the San Gabriel and Santa Susana mountain ranges attain heights of 3,000 feet or more, thus making the notch a striking physiographic feature as viewed from most parts of the San Fernando Valley. Several small tributaries have carved deep, V-shaped canyons from the north and from the south toward the narrow, knife-like divide separating the Santa Clara and Los Angeles river basins so that the railroad was able to enter a long tunnel at the 1,500-foot level without a very difficult climb. One branch of the highway crosses the pass by means of a short tunnel at an elevation of about 1,700 feet. A newer branch of the highway crosses the pass through a series of deep open cuts in Welden Canyon about a half mile west of the railroad tunnel.

TOWN PATTERN AND LAND OCCUPANCE

The political boundaries of San Fernando are highly artificial, having been established, in 1911, so as to include only the property of persons who were favorable to incorporation in so far as that was practicable. The present town limits on the southwest side of the railroad, however, correspond in several portions with the outlines of the first subdivision of

³ A major highway crossing the San Gabriel Mountains northwest of Pasadena and utilizing in part the canyon of the Arroyo Seco is now under construction. When it is completed some of the traffic between Los Angeles and central California undoubtedly will be diverted from the San Fernando route.

FIG. 3.—Land Occupance in San Fernando in 1931.



1874. Less than half the incorporated area is utilized for urban purposes, but in places urban development extends slightly beyond the town limits. Extensive tracts of subdivided land containing few or no houses are characteristic about most borders of the town.⁴ Especially to the south and southwest, however, highly productive farm lands adjoin fully occupied urban tracts.

The oblique orientation of the town's rectangular pattern was determined by the direction of the railroad between Fremont Pass and Glendale Gap. Fortunately the streets at right angles to the railroad parallel approximately the edge of Pacoima Wash and the gradient of the piedmont slope is in no place sufficient to interfere with the street pattern as adjusted to the transportation route. The diagonal direction of the street pattern is an advantage in that it permits most houses to be so oriented as to get more hours of sunshine in a greater number of rooms, a feature of no small consequence where sunshine alone provides sufficient heat for homes on most winter days. It is strange that such a street pattern is not more common to towns in southern California where sunshine is so much appreciated in the home and where certain other Spanish and Mexican customs in town planning have been widely adopted.

San Fernando is divided into two major parts by the main line of the Southern Pacific Railroad (Fig. 3). Most of the manufacturing industries are located in the narrow strips of land, originally set aside for that purpose, immediately bordering the railroad (Fig. 4). The principal business street parallels the railroad at a distance of 400 feet to the south and represents a significant commercial adjustment to the major highway artery. The definite allotment of a rectangular plot of land beside the railroad to industries and the temporary divergence within the town limits of the main highway which normally parallels the railroad *closely* is characteristic of scores of towns along the Southern Pacific Railroad in California. Several of the most important industries and institutions employing persons living in San Fernando, however, lie entirely outside the political limits.

The early establishment of a small business and hotel district in the northeast half of town near the railroad depot (Fig. 3) indicates the greater prominence of the steam railroad in the life of the town during the pre-automobile period. The fact that Maclay Avenue is now the main traveled "north-south" street in the northeast half of the town helps that minor commercial center to survive.

⁴ Much real estate activity occurred in the vicinity of San Fernando about a decade ago as is shown by the fact that, during 1923, 30 or more subdivisions including more than 4,500 lots were launched. (*San Fernando Sun*, November 30, 1923).

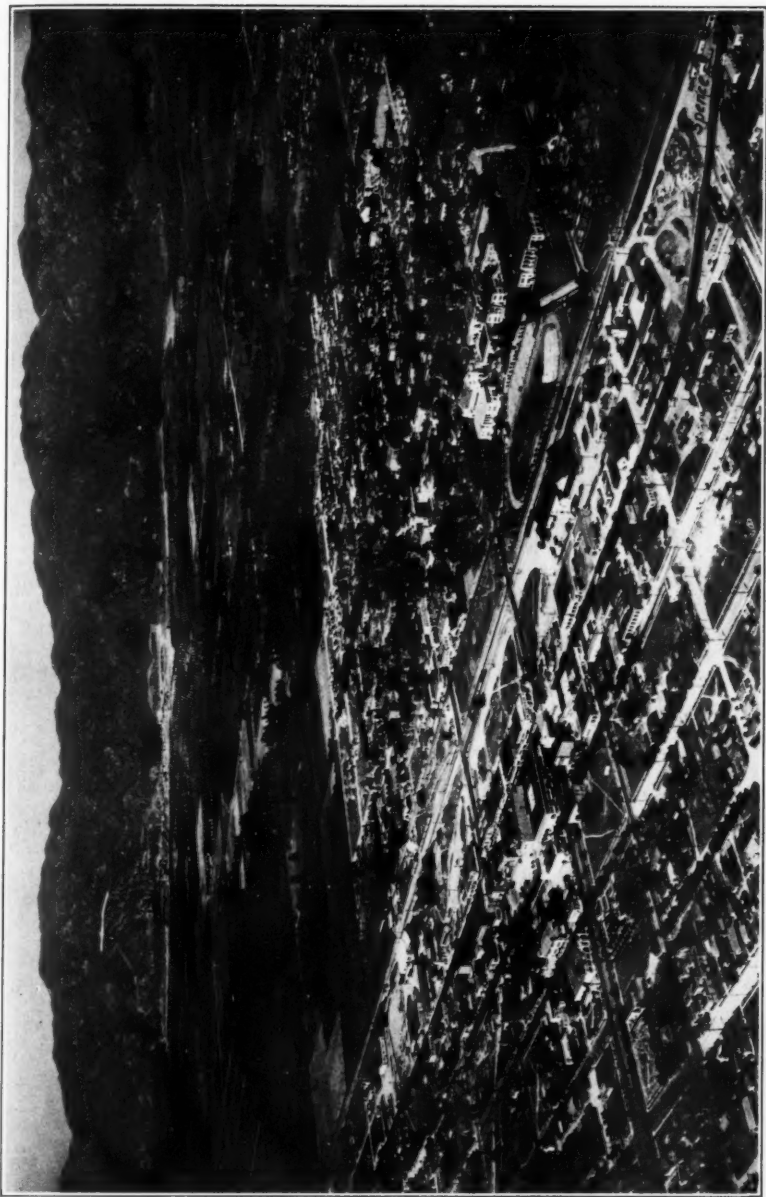


FIG. 4.—Airplane photograph of San Fernando, looking toward the north. The railroad and principal highway extend diagonally across the picture toward the northwest. A hospital stands at the contact between mountain and piedmont at the extreme right. (Compare this photograph with the maps.)



FIG. 5.—Representative street and homes in the northeast portion of San Fernando. Pepper and olive trees border the well-paved street.

The entrance of the Pacific Electric Railway along one of the two principal "north-south" streets in the southwest half of town accounts for a slight extension southward of the central business district along Brand Boulevard. Curiously enough some of the finest homes in San Fernando also lie along that street fronting directly on the railway tracks. Usually, however, such homes are to be found along streets offering greater quiet and seclusion.

Characteristically for southern California, where automobile trucks are depended upon to an exceptional degree for the movement of freight, several industries situated along the steam railroad make no use whatever of that means of transportation. All the lumber yards, for example, are supplied exclusively by trucks from Los Angeles harbor, about fifty miles distant. Practically all merchandise distributed through retail stores is brought from the wholesale dealers in Los Angeles by truck. Were it not for the car-lot movement of fruits and vegetables from San Fernando the local business of the steam railroad would be practically nothing. The local passenger business also is handled almost exclusively by the electric railway and by motor bus lines.

The more attractive residential districts of San Fernando lie in the somewhat higher, less crowded northeast half of town (Fig. 5). Numerous fine old houses of eastern design, built in 1887 or somewhat later, and streets lined with large pepper trees, acacias, palms, and other subtropicals



FIG. 6.—Characteristic street and homes in the Mexican district. The street is not paved and sidewalks are lacking.

prove the early extensive development of the section just northeast of the railroad. The northernmost residential sections are comparatively new and are nearly separated from the somewhat older portion by agricultural land and by little occupied subdivisions. Considerable agricultural land occurs to the west of the rather fully occupied urban area but within the town limits.

The west quarter of San Fernando contains the most crowded and the least attractive residential district in which nearly all the Mexican population is found (Fig. 6). A small, dispersed commercial center has developed in that quarter catering specifically to Mexicans. In places large ornamental trees and numerous old residences evince early settlement. The concentration of the Mexican population in that district began early in the life of the community and appears to have resulted from their extensive employment on the farm lands lying adjacent to that portion of town.

The south quarter contains medium-sized homes, and, due to its comparative newness as a subdivision, it has many vacant lots. As along the north boundary, some urban development has progressed along several streets beyond the town boundary in the south chiefly due to the energy of subdividers. The fact that those houses are in Los Angeles rather than in San Fernando seems to afford the inhabitants no particular advantage or handicap.

Most of the houses in San Fernando are of the one-story bungalow type

with wood or stucco construction (Fig. 5). A number of homes, churches, and other buildings are made of granite boulders obtained from the near-by stream washes. The newest houses of better quality reflect the recent popularity of modified Spanish design. The majority of business establishments are one-story brick structures but several rise to second or even third story levels. Paved streets and sidewalks are typical except in the Mexican district and in the newer subdivisions.

Table I, which is based on planimetric measurements of land occupancy as given on the map in Figure 3,⁵ shows that only 42% of the 2½ square miles of area included in the political limits of San Fernando are at present actually utilized for urban purposes. Land devoted to public streets alone makes up 21.7% of the area. Schools, churches, free clinics, and recreational centers occupy 2.5%. Although whites form only 60% of the total population of San Fernando, their homes occupy two and one-half times as much land as do the homes of the Mexicans who constitute practically all the remainder of the population. The small importance of industrial de-

⁵ The engineering blue-line base maps used in the field (Scale: One inch equals 100 feet) were of sufficient size to permit the use of a "fractional device" for recording as many as a dozen facts describing the character and use of each unit of area. The city lot was adopted as the smallest unit for consideration in mapping. Pacing was used to measure distances when needed.

In residential, commercial, and industrial districts each type of use was first indicated by the appropriate initial letter (R, C, or I) placed before the fraction. In residential areas digits in definite places within the numerator indicated facts about the type of house, construction materials, age and condition of house, race of inhabitants, and incidental uses other than residential. Facts concerning the use and character of the yard and street were recorded as digits in definite places in the denominator. In commercial and industrial districts particular attention was given to character of use, size of establishment, and type of management. Where vacant lots were discovered, care was taken to note abandoned structures, abandoned orchards, and all temporary uses made of such lots. A key, which classified all observations to be made and which assigned appropriate numerals to represent each type of observation was used during mapping operations.

As an example, the symbol, $R\frac{221110}{125113}$ indicated first that a given lot was occupied by a residence. The numerator showed that residence to be of medium size, stucco construction, recently built, in good condition, inhabited by whites, and used for residence purposes only. The denominator showed that the lot contained a private garage, was landscaped, contained remnants of an early citrus grove, and that it fronted on a street which was paved, had sidewalks, and ornamental trees.

There seemed to be no need for recording for each lot data on topographic situation, soils, drainage, and other environmental conditions because rather detailed modern maps (Scales of 1:62500 and 1:24000) showing such facts were already available and conditions did not vary sufficiently within short distances to affect urban development.

velopment is clearly shown by the fact that less than 1% of the land area is devoted to industrial uses.

TABLE I
AREAS DEVOTED TO PRINCIPAL USES WITHIN TOWN LIMITS
(Based on Land Utilization Map, Figure 3)

<i>Type of Use</i>	<i>Acres</i>	<i>Per Cent</i>
Commercial	36.8	2.5
Industrial	8.5	0.6
Public Uses	350.1	24.2
(Streets, schools, churches, etc.)	60.4	4.2
Mexican Residential	151.6	10.5
White Residential	358.6	24.8
Vacant Lots	269.6	18.7
Unimproved	209.4	14.5
Total City Area	1445.0	100.0

The large area classed as vacant lots reflects the too-eager efforts of landowners and speculators to expand the urban frontier, a condition which is very characteristic throughout southern California. It represents an economic waste to the community in several ways. Often times productive orchards are abandoned when subdivision takes place since the many small tracts can not be cared for economically by scattered owners. Home gardening, which might utilize many vacant lots in a humid climate, is of little significance in southern California probably in the main due to the high cost of water. Streets, sidewalks, electric lights, and other utility connections usually must be maintained even for a few widely scattered houses which of course tends to increase the cost of assessments and utility rates.

The area of unimproved land consists entirely of the slightly entrenched, boulder-strewn flood channel of Pacoima Creek, all of which is unfit for agricultural or urban uses. East of San Fernando, however, such wash areas have actually been subdivided for residential purposes, but only the markers indicating the names of imaginary streets call attention to such folly.⁶

RELATIONSHIP TO FREMONT PASS

When it was assured, in 1874, that the main valley line of the Southern Pacific Railroad was to be completed between Bakersfield and Los Angeles

⁶ The following is a brief, impressionistic description of San Fernando in 1900: "The entire town of San Fernando can be seen at a glance—a little bit of a place, like many a town seen in the West; one street, perhaps a mile long, bordered on each side with a narrow row of frame houses and shanties, two of them so-called hotels,

through Fremont Pass,⁷ a group of capitalists purchased the north half of San Fernando Valley from its Mexican owners and promptly started a town along the railroad near the early mission settlement.⁸ Up to that time the mission, which was founded in 1797,⁹ had been the center of life in San

and here and there a somewhat more pretentious brick building; while in the distance, in every direction, are ranches of grain, fruit, and vegetables." (Charles F. Carter: *The Missions of Nueva California* (1900), p. 136.)

See the Fernando topographic map which represents the plan of the settlement at a slightly earlier date and shows the town to spread considerably beyond the single main street.

⁷ Fremont Pass had long been recognized as a part of the most direct route between the valleys of southern and central California. The Portolá Expedition, on August 8, 1769, went north from San Fernando Valley across the pass into the Santa Clara River Valley according to Crespi's diary of the expedition. General Fremont's military expedition, during the American conquest of the State (1847), proceeded southward through the pass which bears his name. During the 1850's the pass was utilized by many immigrant parties bound for the gold mines of the Mother Lode Country and Kern County. Large numbers of cattle were driven across the pass from the "cow counties" of southern California to the gold fields of the north. In 1850 a toll road was built over the pass to accommodate the relatively large amount of traffic which focused upon the only direct route between the south and the north. In 1858 the Butterfield stage route connecting San Francisco with St. Louis was made to utilize Fremont Pass. In order to reduce the heavy grades, the county cut a defile about 100 feet deep and 15 feet wide through the soft sandstones forming the crest of the pass in order to permit wagons to cross more easily. In the early years it had been necessary to use ropes in getting wagons safely over the steep divide. (W. P. Blake, *Pacific Railroad Reports* (1856), Vol. 5, Part II, p. 73; and Harris Newmark: *Sixty Years in Southern California* (1926), pp. 120-121).

⁸ The original Rancho Ex-Mission San Fernando, as confirmed by the U. S. Land Office, included nearly all of San Fernando Valley and it contained 116,858 acres. After the secularization of the missions, control of the land passed to the Mexican government. In order to raise money to resist the entrance of the Americans, Governor Pico sold it in 1846 to Eulogio de Celis for \$14,000. In 1854, Pico bought a half interest in the ranch for \$15,000. In 1868, the south half of the ranch was sold to a group of Americans for \$114,000 and, in 1874, the bulk of the north half of the ranch (56,000 acres) was sold to the founders of San Fernando for \$115,000. (J. A. Graves: *My Seventy Years in California* (1927), p. 139.)

⁹ San Fernando Mission was established to fill in the gap between San Buena-ventura and San Gabriel missions, the plan being to have missions located at intervals of "one day's journey" along the Camino Real. The site was first investigated in 1795 but was objected to on the grounds that it was too far from San Buena-ventura and too distant from timber supplies. Those objections were finally considered to be more than balanced by the advantages it presented of extensive cultivable and grazing lands and by the proximity of many Indians. (Theodore H. Hittell: *History of California*, Vol. 1 (1898), pp. 484-485; Fr. Zephyrin Engelhardt: *San Fernando Rey—The Mission of the Valley* (1927); and Ludwig L. Salvator: *Los Angeles in the Sunny Seventies, Observations made in 1876*, translated into English by M. E. Wilbur in 1929.)

Fernando Valley, and practically all the valley land had been devoted to grazing by the mission herds. Farm lands near the town site also were offered to settlers in 20, 40, and 160-acre tracts at the time when the town was being established. The town was named for the valley in which it lay, El Valle de San Fernando. The valley was named by the founders of the mission in 1797 in honor of the King of Castile, Saint Ferdinand the Third. The valley had previously been called "El Valle de Santa Catalina de Bononia de los Encinos" (The Valley of St. Catherine of Bononia of the live oaks) by Portolá in 1769 but that name was discontinued after the mission was established.¹⁰

Construction of the railroad began at both ends and it was planned to join the two sections at Fremont Pass where a tunnel 6,940 feet in length was planned. The railroad was completed from Los Angeles to the pass in 1874 and the newly established town served as the terminus of the southern unit for about three years while the tunnel was under construction. A small depot was built and six-horse stages met the daily train to carry passengers through Fremont Pass and on to the San Joaquin Valley.¹¹

¹⁰ The description of San Fernando Valley by the Blake Expedition of 1853-54 which entered through Fremont Pass is significant:

"San Fernando Valley presented a nearly level surface, without trees or verdure, and bounded on all sides by distant ranges of mountains. On turning the point of a hill, we suddenly came in sight of the Mission buildings, which, with the surrounding garden stood isolated in the seemingly desert plain. The gardens were enclosed by walls, but the graceful palm rose above them, and groves of olive, lemon, and orange trees could be seen within. Outside the walls the surface was barren and gravelly, and the fertility within is the result of irrigation.

"Herds of cattle were seen on parts of the broad plain, feeding on dried grass or the burrs of the California clover, which covers the ground in the latter part of the summer when all the grass has disappeared. This plain doubtless presents a beautifully green surface in the winter and early summer when watered by the rains. The road was bordered in some places by a low growth of shrubbery and cactaceae, which gave a peculiar aspect to the country. The distant ranges of mountains had a peculiar barren look." (W. P. Blake: Reports of explorations and surveys to ascertain the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean; Geological Report, Vol. 5, Part II (1857), pp. 74-75.)

¹¹ Between 1858 and 1874 the Butterfield stage route between central California and Los Angeles had extended south from Fremont Pass to the Mission along the depression now occupied by the aqueduct reservoirs (Fig. 2). About a mile to the northwest of the mission in the low gap in the hills was Lopez Station at which all stages and wagon trains stopped. It had the only post office, school, stage house, and store in the valley. The Lopez route afforded a slightly more direct route to Los Angeles via Cahuenga Pass and also avoided the difficult Pacoima and Tujunga washes. The Glendale Gap was utilized in preference to Cahuenga Pass only after the railroad had forced a way across the broad washes which had long handicapped the use of the distinctly lower route into Los Angeles. (The Valley of San Fer-

The town site of 1,000 acres lay on the "south" side of the railroad and extended as far southwest as the mission. The proposed principal street (Mission Boulevard) extended from the railroad through the center of the subdivision to the mission buildings and gardens. Blocks were formed 200 feet wide and 500 feet long each containing 40 lots (25 x 100 feet). Streets were provided with widths of 60 feet. The south half of the subdivision and several rows of blocks on the west side were subsequently returned to acreage and the portion nearest the railroad was resurveyed in 1888. In spite of the abandonment of blocks on the borders of the subdivisions, however, and although the lots in numerous blocks were rearranged the essential pattern features of the southwest half of San Fernando were fixed by the original town plat in 1874.¹² An important alteration took place as recently as 1913, however, when the electric railway entered the town from the south and caused one tier of blocks to be rearranged so that the long sides of the blocks might face the railway and so that a wider street could be provided to accommodate the tracks. With few exceptions the names of streets appearing on the original plat and commemorating persons prominent in early southern California remain in use today.

Excursion trains carried interested persons from Los Angeles to San Fernando during the summer of 1874 but not many lots were sold because Los Angeles had only some 8,000 inhabitants and southern California had not yet become a tourist center.¹³ Construction of the tunnel, which at times required 1,500 men, however, attracted much attention to San Fernando and created some business activity.

A number of small retail stores were immediately established in the new town and plans were made for the building of large grain warehouses to store the output of surrounding ranches. A small brickyard was opened to

nando; a collection of local historical facts published in 1924 by The San Fernando Valley Chapter of the Daughters of the American Revolution.)

¹² Map of town plat as entered in the Los Angeles County records on September 15, 1874, by Charles Maclay; Scale: 400 feet to the inch. (Los Angeles County, Miscellaneous Record, No. 2, pp. 591-593.) Resurvey of San Fernando, September 24, 1888 (Los Angeles County, Miscellaneous Record, No. 34, pp. 65-66).

¹³ The railroad offered to carry prospective residents, as well as lumber, from the harbor at San Pedro to the new town at half rates to encourage settlement. (John S. McGroarty: *History of Los Angeles County* (1923), pp. 352-353.)

W. A. Spalding in his *History and Reminiscences of Los Angeles* (1930), Vol. I, p. 208, remarks about his visit, in 1874, to the proposed town of San Fernando; "A plat of the town was in evidence and some attempt was made to auction lots but the crowd was not enthusiastic. The outlook was not one to inspire enthusiasm—just the newly laid track and a small wooden building to serve as a station; the ruined Mission building in the background, and a waste of sand and gravel all about. . . . It required somewhat of an imagination to induce the thought that there was any demand for a town at that point, or that there ever should be a town at that point."

provide building materials and it was originally planned (without avail) that all structures in the town were to be of brick. An olive oil refinery and soap factory were built to care for the olive crops secured from the old mission orchard.¹⁴ The construction camp at the south portal of the tunnel, however, showed much more activity as a settlement during its brief existence than did the early San Fernando. In fact several stores and the post office were transferred temporarily from San Fernando to the tunnel settlement to accommodate the workers.

The transfer from Los Angeles of the Cerro Gordo wagon freighting station in 1874 did most to enliven the town. Lead, silver, and borax were hauled from the Owens Lake district over Fremont Pass to San Fernando where they were transferred to the railroad for shipment to San Pedro harbor.¹⁵ A hotel for the teamsters, barns, warehouses for feed and a blacksmith shop were located on a six-acre tract on the south side of the railroad within the town limits. Unfortunately, that important business was lost as soon as the railroad was extended northward into the Mojave Desert. During the next decade the town made little growth but it was revived during the real estate boom of 1886-87.

Upon the completion of the railroad, San Fernando became a small railroad service station because additional engines were required to assist heavy due to the centralization of engine service at Saugus, north of the pass, and trains over Fremont Pass. Only recently was the roundhouse abandoned the use of larger engines which do not require pusher service. Great volumes of railroad traffic move *through* the modern town.

Controlling as it does the entrance to Fremont Pass, San Fernando lies astride the principal highway now connecting southern California with the San Joaquin Valley. Through the center of town, along San Fernando Road, moves a great amount of passenger and freight traffic (Fig. 7). Local passenger cars and tourist automobiles of all descriptions are interspersed with great trucks and trailers loaded with cotton, hay, vegetables, fruits, live stock, petroleum products, and innumerable other things. The stream of traffic flows through town both day and night, and every day in

¹⁴ Los Angeles Evening Express, August 8, 1874; and Los Angeles Daily Star, September 23, 1874.

¹⁵ The bullion from the Cerro Gordo mines, located northeast of Owens Lake, was hauled over 200 miles by wagon to San Fernando. Stations for changing teams were situated at about 18-mile intervals along the route. As many as 80 teamsters and 1,600 mules were engaged in the freighting operations of that company. The lead was cast in 80-pound bars at the mines and it was shipped from San Pedro to San Francisco and thence to England for refining. (Los Angeles Evening Express, November 13, 1874; H. Newmark: *Sixty Years in Southern California*, pp. 385-86.)

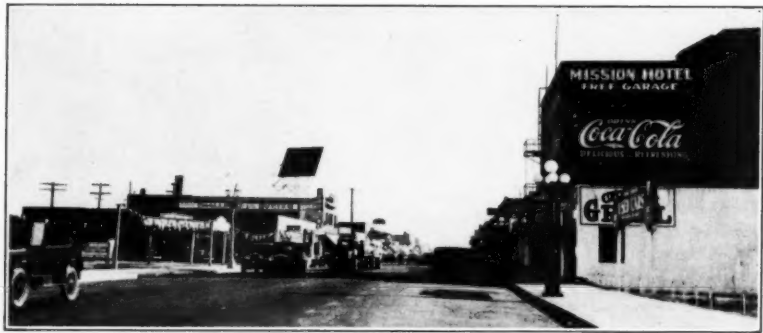


FIG. 7.—View of the principal business district along San Fernando Road (Porter Avenue) near the center of town.

the year.¹⁶ Its volume and character fluctuate from hour to hour and from day to day according to the "season." Much of the "through" traffic does not stop in San Fernando but some of it does. Lunches or lodging for travelers, and gasoline and repairs for motor vehicles are the types of purchases made. The great volume of traffic explains the existence of an "oversupply" of filling stations, automobile accessory shops, repair garages, lunch stands, and hotels which fairly line both sides of the main street. A large automobile camp ground at the western edge of town is supported solely by transient motorists. The heavy traffic provides much of the activity and "color" which are characteristic of the town's leading commercial street. A traffic problem is created, for patrons of the stores find it difficult to "park" their cars along the busy thoroughfare and the through traffic finds it difficult to get through the town without delays.

The manner in which businesses dependent upon automobile traffic cling to major highways is well illustrated by San Fernando Road. Along much of the 25-mile distance between Fremont Pass and Los Angeles such business houses as garages, filling stations, cafes, fruit stands, auto camps and drive-in markets are closely spaced or occur at frequent intervals. Beyond Fremont Pass, Newhall and Saugus are largely continuations of the same type of commercial development along the major highway.

Fremont Pass is also utilized by other types of transportation service. Three large power lines carry hydroelectric energy from the southern Sierra Nevada Mountains and from power houses located along the Owens River

¹⁶ More than 6,500 automobiles passed a point on the state highway west of San Fernando during a period of 16 hours (6 a. m.—10 p. m.) of normal traffic flow in September, 1930. Larger numbers may be counted on exceptional days. (Data from Southern California Automobile Club, Traffic Survey Department.)

aqueduct to Los Angeles. Sierra power is used in San Fernando and Los Angeles aqueduct power is supplied to the surrounding district because it is a part of Los Angeles politically.

Several large steel pipe-lines carry natural gas and crude petroleum from the San Joaquin Valley and from the oil fields of Ventura County to Los Angeles. An oil pumping plant was built in 1912 near the western edge of town for the purpose of forcing crude oil the remaining distance to the refineries. San Fernando is supplied with natural gas from the mains traversing the town. A small amount of oil has been produced and refined near Newhall (on the north side of Fremont Pass) since 1875.

Trunk telegraph and telephone lines parallel the railroad and highway across Fremont Pass. The Los Angeles aqueduct, likewise, crosses the lowest part of San Gabriel range. Even the commercial air routes between Los Angeles and central California follow the lines of surface transportation and airplanes are able to operate safely at lower altitudes in crossing the mountains.

ADEQUATE LOCAL WATER SUPPLY

A prime reason for the present political independence of San Fernando and for the early development of the town and surrounding agricultural district is the availability of a suitable water supply from local sources. Running water from a marshy tract and from flowing wells was a strong inducement offered settlers during the great real estate boom of 1886-87 when the large tract of valley land on the northeast side of the railroad was first subdivided for urban and agricultural development.¹⁷ At that time irrigation was begun rather extensively in the vicinity of San Fernando while the remainder of the valley relied on the uncertain winter rains.¹⁸

The same water supply which served the early town also supplied the mission during the period of its active existence, 1797-1845. The mission was situated just below the point of the San Fernando Hills where seepage from the underground reservoir appeared at the surface throughout the year. A small stone and mortar dam impounded the flow and a tile ditch led the water to the mission fountains and gardens.¹⁹ At a still earlier pe-

¹⁷ A tract of land lying along the north side of the railroad adjacent to the first subdivision in San Fernando and containing about 115 acres was platted for sale as town lots in 1887. Further additions to the town site were made from time to time. Most of the present streets follow the original surveys and many new ones have been added. Agricultural land was sold in large and small tracts in the San Fernando district during and after 1887. (Los Angeles County, Miscellaneous Record No. 17, pp. 11-12; No. 37, pp. 5-16.)

¹⁸ Los Angeles Times, January 1, 1886.

¹⁹ At the time of the founding of San Fernando, the two mission gardens, each containing 32 acres and surrounded by thick adobe walls, were in excellent condition. The one garden contained 300 olive trees, 1,200 grape vines, and a large number of

riod the occurrence of the spring or "ciénega" had invited the establishment of an Indian settlement.

The present urban water supply is obtained from four wells, several of which are 500 feet deep, located along the west border of town. The wells tap the thick water-bearing valley fill which is replenished by wet-weather streams, by seepage from aqueduct irrigation, and by underflow from Pacoima Creek. The San Fernando Hills, serving as a dike, concentrate the underground flow from the piedmont area upon a slight depression along which the wells are located. During the winter season when the demand for water is reduced, several of the wells become artesian. The reservoir from which most of the water is distributed is situated near the high northernmost corner of the town. Ten per cent of the municipal supply is sold for irrigation purposes. The Southern Pacific Railroad has from the outset secured water from the San Fernando supply.

Although the local water supply made possible an important early development of irrigation and still supplies all domestic and irrigation needs within the town limits, the introduction to the valley of Los Angeles aqueduct water, in 1913, was of utmost significance. The abundance and low cost of aqueduct water immediately caused a great expansion in the acreage of intensively cultivated fruits and vegetables in the vicinity of San Fernando. The outlet of the aqueduct was at such an elevation that water could be supplied even to the high piedmont slopes which were especially adapted for subtropical fruits. Depressions among the San Fernando Hills provided suitable sites for reservoirs for storing surplus aqueduct water during the winter for use during the summer irrigation season. While San Fernando had grown slowly from its inception, the introduction of Owens River water to the valley initiated its most rapid increase in population.

INDUSTRIES DEPENDENT CHIEFLY UPON AGRICULTURE

The more important industrial establishments in San Fernando have as the basis for their existence the agriculture of the surrounding district (Fig. 8). Similarly most commercial institutions derive a large portion of their income from the sale of supplies and services to farmers. Fruit and vegetable packing and canning plants are the town's leading industries. That is characteristic of most towns in the Los Angeles basin except in the case of those grouped immediately about the principal metropolitan center and the harbor.

fig, peach, pear, walnut, almond, and pomegranate trees. The other contained 320 olive trees, 7,000 grape vines, and orange, fig, peach, pear, and pomegranate trees; all were irrigated by the system of ditches and reservoirs which had been constructed 70 years before. (Ben C. Truman: *Semi-Tropical California* (1874), pp. 188-193.)

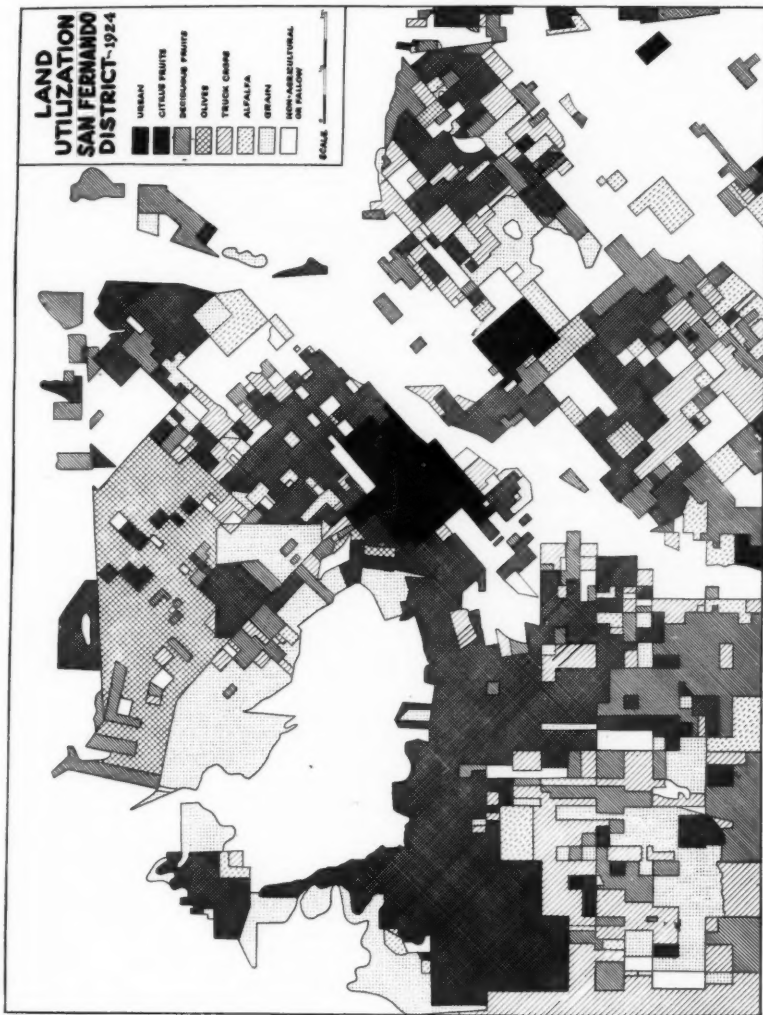


FIG. 8.—The utilization of land in the vicinity of San Fernando in 1924. Relatively minor changes had taken place by 1931. (Data furnished by the University of California, College of Agriculture, Division of Soils.) (Compare with Fig. 2 which covers identical area.)

Two large citrus packing plants are situated along the railroad near the center of town (Fig. 9). Three others are located near the mission (Fig.



FIG. 9.—One of the citrus packing plants near the center of town. Considerable vacant land lies along the railroad near the center of town awaiting the establishment of industries.

2). Two of the packing plants handle only lemons, one packs oranges and grapefruit, while the others receive all kinds of citrus fruits. Four of the plants are affiliated with the California Fruit Growers Exchange and the other with American Fruit Growers, Inc. The location of three of the plants near the mission, off the line of the transcontinental railroad, is at first surprising. However, through an agreement between the Southern Pacific and Pacific Electric railroads, there is no surcharge for transferring fruit cars between the plants and the steam railroad. Furthermore, they are slightly nearer the large compact citrus-growing district along the south side of San Fernando Hills (Fig. 8). The plants near the center of town draw most of their fruit from scattered groves situated to the north and east of San Fernando. An excellent system of paved highways connects all packing plants with the groves. Although several hundred acres of citrus groves have been destroyed during the past decade through subdivision, new plantings have more than balanced the loss. There are approximately 7,000 acres of citrus groves in the San Fernando district, of which 4,200 are oranges, 2,600 are lemons, and 200 are grapefruit. About 1,200 cars of citrus fruits are shipped from San Fernando packing plants annually.²⁰

Except for brief interruptions the citrus packing plants operate at varying capacities throughout the year. Lemons are harvested during every month with the principal yield coming in early winter. Valencia oranges mature in summer and early autumn while Navels are picked in winter and in spring, thus giving a nearly continuous supply. As many as 750 girls and women from San Fernando (white and Mexican) are employed at times in grading and packing citrus fruits. Some men are utilized for the heavier

²⁰ Los Angeles County Horticultural Commissioner's Report, 1931.

work of handling boxes of fruit and loading railroad cars. Cull oranges find a ready sale in many fruit stands along the major highway. Cull lemons are shipped to a plant at Corona where by-products are extracted. A small orange marmalade factory utilizes fruit from local groves.

A fruit and vegetable canning factory, built in 1918, is situated in the southwest half of town and is served by the Pacific Electric Railway (Fig. 2). Apricots, peaches, lima beans, tomatoes, spinach, and peppers are canned as one harvest succeeds another, thus at times furnishing employment for as many as 250 women and a few men during a long season. The position of the plant adjacent to the Mexican residential district facilitates getting the type of labor which is extensively used. The steady destruction of deciduous fruit acreage in the district (usually to be replanted to Valencia oranges) has made it necessary to secure fruits from other centers in southern and central California. Vegetables are obtained locally and also from Simi Valley about 15 miles to the west. During most of the year quantities of fresh vegetables, as lettuce, carrots, cabbage, onions, spinach, beans, and asparagus are shipped from the San Fernando district by truck to Los Angeles markets. Much lettuce is also shipped to eastern states in early winter by railroad from San Fernando. In summer melons are an important truck crop on sandy soils in the area.

A large olive oil plant was established, in 1901, near San Fernando to care for the product of 1,800 acres of trees planted by the Los Angeles Olive Growers' Association about a decade earlier²¹ (Fig. 2). The groves were situated on light sandy soils and were not originally irrigated. Oil could not be produced profitably in competition with European countries so the groves were later grafted to larger pickling varieties wherever irrigation water could be made available. Many small plantings of olives were made elsewhere in the San Fernando district and along various streets in town they were planted as ornamentals. Some plantings have been abandoned in recent years and many mature trees have been sold for landscaping purposes in Los Angeles. The olive pickling plant now supplements the diminishing local supply with shipments of olives from central California and it also cans figs, grapefruit, and pimientos. Olives are harvested during autumn and early winter, while pickling operations continue through the winter and spring. Most of the workers are drawn from San Fernando. At one time several smaller olive packing plants were situated in the district but they have disappeared.

A small meat slaughtering plant, established in 1902 near the southeast border of town beside Pacoima Wash, employs a number of workers from San Fernando. The position of the plant away from the railroad forces it to rely wholly upon trucks for transportation of live animals and meat products.

²¹ San Fernando Valley Press, Feb. 1, 1918.

Poultry raising is important on numerous small farms in the area tributary to San Fernando. Some poultry supplies and products are handled by dealers in San Fernando but Van Nuys is much more important as a market center for that industry. In many instances the poultry industry merely supplements the income of the worker secured from another source. Several large nurseries, producing flower bulbs, rose bushes and other ornamental plants, are situated near San Fernando and they give employment to a number of townsmen.

The manufacture of concrete pipe for irrigation is a small industry which owes its existence to the nearly universal practice of irrigation in the vicinity of San Fernando. Several blacksmith shops perform the usual work of horseshoeing and repairing farm implements. A small cabinet works specializes in the construction of commercial automobile bodies. A gravel plant in Pacoima Wash (now abandoned) has provided much rock material for highway and concrete construction. Tujunga Wash provides the raw materials for several large rock plants serving a wide-spread market in Los Angeles County.

Although San Fernando, even as late as 1910, was an important shipping center for barley and wheat, that trade has entirely ceased. The small amounts of barley now grown in the vicinity are used entirely for grain hay. The decline of the grain trade at San Fernando reflects the remarkable and comparatively recent transition in the agriculture of the entire valley from extensive grain production to intensive fruit, vegetable, and dairy industries.²²

LARGE MEXICAN POPULATION

Owing to the seasonal demand for laborers in many industrial establishments as well as in most agricultural operations in the San Fernando district, there is great demand for workers who are able and willing to do all kinds of jobs as the needs arise. The Mexican population (about 3,000

²² Grain growing began to replace extensive sheep and cattle raising in 1874 and did so almost completely after the drought year of 1877. In 1888, more than half a million bushels of wheat were harvested in the valley. It was not uncommon to find 60,000 acres devoted to wheat. (*Rural Californian*, Vol. 16 (1893), pp. 291-294.)

Shipments of produce from San Fernando over the Southern Pacific Railroad in 1890 included the following numbers of carloads: wheat 503, barley 87, hay 58, straw 37, charcoal 13, honey 14, oranges 8, olives 1, peaches 3, grapes 3, onions 1, raisins 1, calves 2, and hogs 2. (*Los Angeles Times*, January 1, 1891.)

By 1910, there were some 15,000 acres devoted to fruit but much of the remainder of the valley was still planted to wheat. In anticipation of the coming of aqueduct water for irrigation, however, that year marked the final stand of wheat farming and the great dry-farm ranches were subdivided. (*The Story of the Great San Fernando Valley*, published by the Security-First National Bank of Los Angeles.)

in number) fills a large share of that demand. Many of the women work in the packing houses and canneries, as has been shown, and most of the men are employed in growing and harvesting crops. The large numbers of agricultural laborers residing in towns constitutes one of the distinctive features of many southern California urban centers. Although the white owners or lessees live on the land the arrangement savors somewhat of the rural villages so characteristic of many parts of the world outside Anglo-America.

Citrus ranchers usually hire Mexicans to install irrigation systems, plant new groves, and carry on routine orchard operations, such as irrigation, spraying, fumigation, pruning, cultivation, fertilizing, and frost protection. Citrus packing associations hire gangs of Mexicans to harvest all the fruit for their members. Growers of walnuts, olives, flowers, vegetables, nursery stock, grain and beans also utilize Mexican laborers as needed. They find work with construction gangs of many sorts. When work of no kind is available locally many of the Mexican families migrate temporarily to other parts of the State especially for fruit harvesting. Since no rancher can employ a maximum quota of workers throughout the year, and owing to the changing location of their work from day to day, the Mexicans find it advantageous to live in town. Each morning the gang foremen assemble the required numbers of workers for specific jobs and at night they return in their automobiles. Many whites are engaged in the same occupations which attract the Mexicans, either as foremen or as laborers.

Practically all of San Fernando's Mexicans are located in the west quarter of town (Fig. 3). A few families live in small clusters along Pacoima Wash and in cottages provided by one of the citrus packing houses near the mission. The concentration of the Mexican population results from their desire to be with their countrymen and also from the fact that they are "prohibited" from buying property or renting homes in most other parts. There are some white families in the district and a few Italians, Japanese, and Chinese. The Japanese and Italians are commonly engaged in vegetable growing. In spite of slightly lower elevation the natural environmental conditions of the Mexican district are nearly as favorable for residential purposes as are those in any other part of town.

The Mexican district has many characteristics which distinguish it from the remainder of San Fernando (Fig. 6). All the homes in the area are very small in spite of the normally large families. Houses are usually made of wood although there are a number of stuccos and adobes. The lots are small, often 25-foot fronts, and the streets are commonly not paved, nor do many of them have sidewalks. The yards are crowded with old buildings, fruit trees, clumps of cactus, and crude outdoor laundry or baking facilities. Small but neatly kept vegetable and flower gardens often brighten other-

wise unkempt surroundings. Lawns are usually lacking as they probably should be in a dry-subtropical climate. The prevalence of extensive lawns in southern California, where they are maintained throughout the year at considerable cost, undoubtedly reflects the recent arrival of most of its inhabitants from humid climates. The Mexican, coming from a dry climate where water is expensive, does not maintain a lawn when he migrates to southern California.

Small poultry yards commonly fill up the remainder of the yard, all of which is usually enclosed by a picket or wire fence. Houses commonly are unpainted but are equipped with electricity and modern plumbing facilities. Numerous goats tethered on vacant lots provide milk for some families. As compared with Mexican quarters in other towns of similar size the San Fernando community ranks among the cleaner and more attractive.

The Mexicans hold fast to many of their native habits and customs. Even the children prefer to speak Spanish and many of the older people refuse to learn English. A finely equipped public school in the center of the district provides exclusively for the instruction of Mexicans, both young and old. The Mexicans are fond of games and on numerous vacant lots are handball courts and improvised grandstands for baseball. Pool halls are especially common in the scattered and shabby business district which caters to the Mexican trade. The shopkeepers are usually Mexican or Oriental. Foodstuffs, wearing apparel, and novelties to satisfy the special demands of Mexicans are available there. Many business establishments in the central commercial district also cater to the wants of the Mexican population and undoubtedly secure more of their business than the smaller stores in their own neighborhood. A large free health center, supported by the county, does much to improve health and sanitary conditions among that population. Although the Mexicans are somewhat of a social and economic problem in San Fernando they do surprisingly well in adjusting themselves to the opportunities and demands of the community.

HEALTH RESTORATION CENTER

Although San Fernando is in no sense a resort center it is recognized to have a climate which is conducive to the treatment of tuberculosis. Two large hospitals, one built by Los Angeles County in 1919 and the other by the Federal Government in 1925, are situated on the uppermost piedmont north of San Fernando (Figs. 2 and 4). Moderate elevations of 1,400–1,500 feet, a dry and sunny atmosphere, freedom from fog, quiet surroundings, and easy accessibility are important advantages of the sites. The care of approximately 1,000 patients provides employment for several hundred physicians, nurses, and other workers, many of whom live in San Fernando. Frequently the families of patients wish to be within easy reach of

the hospitals and they transfer their residence to San Fernando. Thus the two institutions are of much significance to the town as employers of many highly trained workers and as a stimulus to business and town growth. A few patients are kept in private homes in San Fernando.

RELATIONSHIPS TO LOS ANGELES

In spite of being a separate urban unit San Fernando has many intimate relationships with Los Angeles, and there is a strong possibility that at some time it will become a part politically of the larger city. As has been explained, San Fernando secures its water supply from an underground reservoir which is claimed by and is situated principally in Los Angeles. The agricultural area tributary to San Fernando is almost entirely within the political limits of the larger city. Several of the industries and institutions upon which San Fernando depends are also located in Los Angeles. The introduction of aqueduct water brought about San Fernando's greatest period of growth. At the time of incorporation (1911) its population was about 1,200; in 1920, it was 3,200; and by 1930, it had increased to 7,500.

In places, due largely to the activity of subdividers, the urban development of San Fernando has spread into Los Angeles territory. Many commercial institutions, as banks, food stores, lumber yards, gasoline stations, automobile accessory stores, ice distributors, real estate operators, and public utilities, are branches of larger organizations in Los Angeles. The schools belong to the Los Angeles system, in part because many of the pupils come from surrounding Los Angeles territory. Since it is only 23 miles to the central shopping district of Los Angeles and since electric train and bus service is well developed, many residents of San Fernando buy some types of merchandise in the larger city. The distance is sufficient, however, to cause every-day necessities to be purchased at local stores.

CONCLUSION

Thus San Fernando functions primarily as an independent local rural market and residence center, but, owing to its proximity to metropolitan Los Angeles, it has acquired some of the traits of a suburban community. Although not within the usual commuting zone, residents of San Fernando make frequent trips for business and pleasure to Los Angeles. Indicative of its dual personality San Fernando supports an active local daily newspaper but also subscribes to the metropolitan dailies very widely. The fact that the city boundaries of Los Angeles actually inclose San Fernando brings the two centers into a state of intimate association in dealing with many civic problems. Its position astride the major transportation route

between southern and central California is primarily responsible for many of the significant urban qualities of the town.

Such, then, is the character in some detail of a representative of one of the important types of urban communities found in southern California. The local physical environment has made definite imprints upon the town in the various stages of its growth as has also its position within a recently developed metropolitan and highly specialized agricultural district.

University of California at Los Angeles.

August, 1933.

An Air Traverse of Central America

ROBERT S. PLATT

PROJECT

A reconnaissance traverse of Central America from Mexico to Colombia was made in five days of January 1933 (Fig. 1). The project was a by-product of a field trip in the northern Andes and was carried out en route to the field in regular planes on air lines.¹ The traverse had a two-fold purpose: first, to test possibilities and limitations of reconnaissance under such circumstances and to consider appropriate technique; secondly, to gather new material on Central America.

EQUIPMENT AND PROCEDURE

The equipment, light and simple, included a Leica Camera with $f: 2.5$ lens, an auxiliary Ica Camera with $f: 4.5$ lens, synchronized watches, field note-book, and maps on a scale of 1:500,000.²

In planes the two members of the party occupied rear seats of the cabin to avoid obstruction of view by wings or struts, on opposite sides, with equipment arranged for rapid use. Observation was through open windows in land planes and hydroplanes, and through closed windows, sometimes stained by salt water and oil, in amphibians. Even under the latter circumstances photographic results were satisfactory (Fig. 6). The chief obstacles to continuous photography were low visibility in early morning for an hour after the dawn take-off, and cloudiness in the afternoon, especially over mountains. Exposures of $1/100$ of a second were short enough, except during very low flying.

PRACTICABLE ACCOMPLISHMENT

It was not practicable to cover the traverse with a continuous strip of photographs nor to construct a map. Under pressure of observing, writing and photographing it was not even practicable to follow the course closely on the available map sheets and identify all landmarks. The location of every photograph and recorded observation along the route was more efficiently calculated after the flight, by a time notation for every item.

¹ The section from Progreso to Mérida was traversed by road, and that from Puerto Barrios to Guatemala City by rail.

² The maps were provided by the American Geographical Society.

occasional notice of the speed of the plane, and observation of a few landmarks to check the route.

One member took photographs and notes to identify them, the other made fuller notes from observation. By intensive concentration it was found practicable to take pictures with accompanying notes at an average rate of one every two minutes, equivalent to about one every four miles. These were close enough together to overlap in some cases when taken from high altitudes, but it was not found so important to have them overlap or even to take them at regularly spaced intervals as to select views showing typical associations of landscape features, or forms and variations of the pattern of terrene occupancy. In some cases four or five pictures were taken in one minute without the writing of notes intervening. Most of the pictures were taken almost vertically to include the nearest part of the pattern. Even through glass at a high angle these were generally successful. Oblique pictures showing the horizon line along the upper edge turned out to be less satisfactory in most cases, because of loss of detail with increased distance.

There were variations in altitude according to weather conditions, the maximum being about 10,000 feet above the land surface. Since at all times the distance was less than two miles it was possible to distinguish below not only forest, grass, and cultivated lands, but also various kinds of crops, and types of buildings. There appeared a striking repetition of similar features similarly arranged with reference to each other and to the natural background, clear-cut variations from place to place and from these readily established generalizations on the pattern of terrene occupancy district by district. Both photographs and notes were directed to the recognition, description and delimitation of the types of occupancy in their natural setting.

FINDINGS

There was confirmation in a broad way of a general composite similarity through the whole traverse area as a part of a major region, Caribbean America, a tropical symphysis of land and sea, of hot lowlands and cool highlands, of wet forest and dry scrub, of populous communities scattered in a wilderness.

There was confirmation also in a broad way of certain larger subdivisions of this region: the moist forested lowlands of the Caribbean margin, the rugged highland backbone of Central American bordered by volcanoes on its southwestern edge, the narrow semi-arid lowlands of the Pacific margin, and the mountain masses of the northern Andes.

But such general concepts seemed elementary and dim, of substance



FIG. 1—The Route and the Intensity of Occupance.

thinly spread, in the presence of the vivid landscape types appearing within and across the larger divisions.

The variety was not chaotic but fitted readily into a few types, distinguished primarily according to intensity of land occupance. Four grades of occupance emerged: at one extreme complete occupance where all the land was occupied to a point of visible improvement (Figs. 2 and 3); at the other extreme blank occupance where none of the land was visibly occupied (Fig. 6); between these close occupance where more than half of the land and sparse occupance where less than half was occupied (Figs. 4 and 5).

In the recognition of a grade of occupance the minimum unit of area did not include all the land in sight but at least several square miles clearly seen below. Exact measurement of the proportion of occupance was impossible, but direct estimate seemed sufficient, since the distinction between grades was not merely quantitative but generally qualitative as well, representing stable differences of development under different circumstances. There were indeed qualitative differences within each grade, but these were for the most part obvious modifications fitting likewise into a few simple types.

COMPLETE OCCUPANCE

Of complete occupance only small spots appear on the map (Fig. 1). Many of these are cities—Mérida, Guatemala, San Salvador, Managua (Fig. 2), San José, Panamá, Medellín.



FIG. 2—Managua, Nicaragua, on the shore of Lake Managua, an area of urban complete occupance. View looking west toward the Pacific. This picture is a better-than-average example of the oblique views.

Rural areas of this grade are confined to exceptionally uniform tracts of land in highly productive agricultural districts. These are in the higher plateau of Guatemala, the lower plateau of southeastern Guatemala and Salvador, (Fig. 3), the lake basin plain of Nicaragua, the plateau of Costa Rica, and the Central Andes of northern Colombia. In these districts spots



FIG. 3.—Complete occupance in a smooth plateau area in Salvador. Cornfields and pastures predominating; coffee in shady groves, a plantation in the right foreground; fields bordered by trees and bushes and some of them by lanes; small scattered houses barely visible.

of smooth land are covered by a pattern of rectangular fields, fairly small, outlined by walls or bushes. In each district a considerable number of the fields are occupied by corn, and others are in pasture or fallow. Small houses are numerous, scattered or clustered among the fields here and there; large buildings are relatively few. Lanes between fields are numerous; highways and railways few.

In other respects there are differences among the districts. The highest, in Guatemala, has fields of wheat or other small grain, as well as corn, while the others have sugar-cane, plantains, cassava and other root crops, and tropical fruits. The districts of medium elevation, in Guatemala, Salvador, Costa Rica and Colombia, have coffee groves among the open fields or grouped around drying floors and buildings. Costa Rica has fields of upland rice. The lowland area in Nicaragua has a higher proportion of pasture.

CLOSE OCCUPANCE

Areas of close occupance, more extensive than the spots of complete occupance, appear in all the districts mentioned above and in some others. Close occupance in the plateau of southeastern Guatemala and Salvador



FIG. 4—Close occupancy in a broken plateau area in Salvador. A field pattern interrupted by steep slopes.

(Fig. 4) extends on into Honduras declining in elevation almost to the Pacific coast. Another lowland district, similar but detached, appears on the Pacific slope of western Panamá. In all these areas the elements of the pattern are like those in the rural spots of complete occupancy—cornfields, pastures and small houses, and, in their respective districts, coffee and other special crops. But the field pattern is irregularly broken, generally by steep and rocky slopes, canyon walls below or lava flows above, wooded in some cases, barren in others.

One area of close occupancy at the northern end of the traverse in Yucatán, far from the others and including no rural spot of complete occupancy, is distinct in character. In this district the pattern is not broken by irregularities of the land surface. Here a homogeneous lowland plain³ is occupied in part by large, rectangular fields of sisal grouped around drying yards and buildings; in part by small subangular fields of corn; and in part by scrubby woods.

The scrub growth occupies about half of the land surface and a question might arise as to whether the occupancy is close or sparse. The former

³ Across the southern part of the area of close occupancy there is a narrow range of hills, conspicuous only by contrast with the predominant plain.

classification seems proper especially since most of the wooded land shows signs of occupance, having been recently cultivated and then abandoned for a period of years in a sort of fallow rotation revealed by field patches in various stages of reforestation.

SPARSE OCCUPANCE

Areas of sparse occupance lie between and beyond those of close occupance. In some cases they are fringes of the same pattern containing the same items as the more densely occupied areas near-by. But in most places they are distinctive settlements of a different sort. Thus between the close occupance in the lake basin of Nicaragua and that on smooth slopes near the Honduran-Salvadorean boundary there is sparse occupance in the Honduran-Nicaraguan boundary zone—a predominance of dissected brush covered hills, a few small groups of buildings with cattle corrals among the hills, and patches of corn, cane and plantains along stream valleys.

Likewise between the Costa Rican plateau and the neighboring districts of close occupance, to the northwest and to the southeast there is sparse occupance among rugged forested slopes, irregular patches of corn, cane and

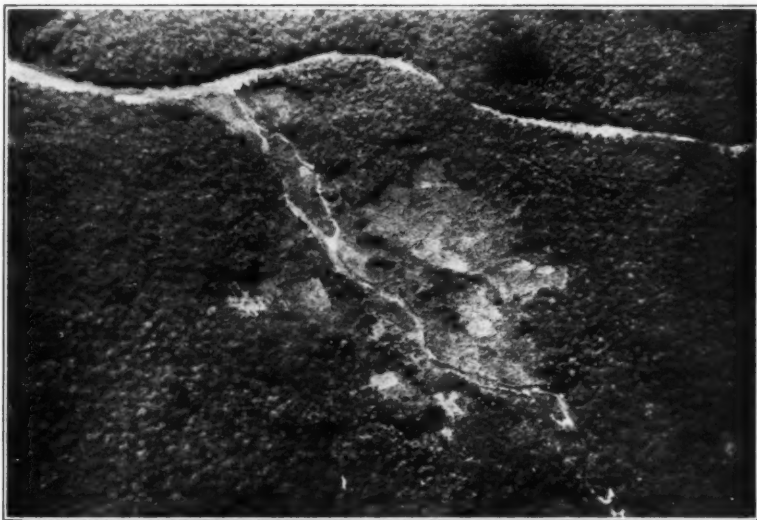


FIG. 5—Sparse occupance in a valley of southeastern Costa Rica. Irregular and impermanent agricultural clearings in a forest along a stream; a master stream across the upper part of the picture.

plantains in mountain valleys (Fig. 5), and irregular patches of fire-cleared pasture on ridges in lower drier areas (Fig. 7). In Colombia there is similar sparse occupance in eastern valleys of the Western Andes not far from closely occupied basins in the Central Andes.

Even in the uniform plain of Yucatán the transition from close to sparse occupance is marked by a qualitative change—the disappearance of sisal plantations and the appearance of isolated huts with their clearings in more luxuriant forest.

Other areas of sparse occupance are not associated with those of denser settlement even by proximity. The coastal margin of British Honduras with a bit of Mexico to the north and Guatemala to the south appears as an area of sparse occupance distinct from other settled areas along the traverse. Here are huts and clearings in the forest, each showing signs of the sort of fallow rotation already mentioned, patches of newly cleared ground, of corn, cane and plantains, and of young forest growth. In a few places along valleys there are larger clearings occupied by banana plantations, and along the coast fringes of coconuts.

Another separate area of sparse occupance is centered on the Panama

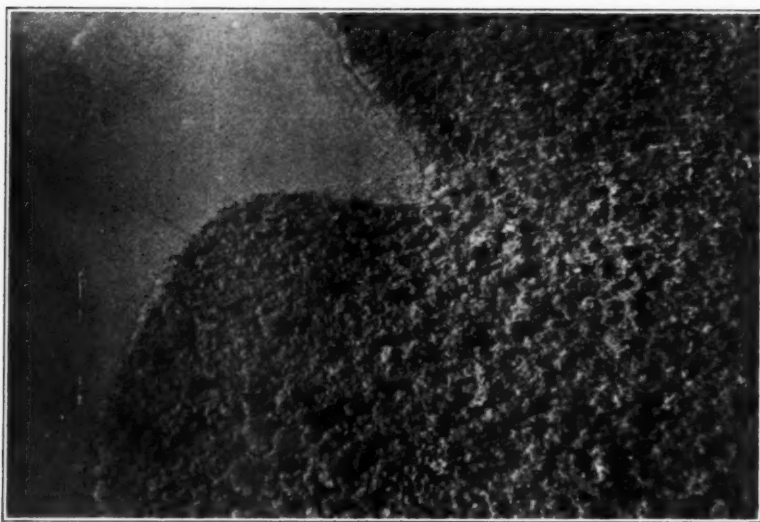


FIG. 6—Blank occupance in the southern part of the Yucatán Peninsula. The forested plain extending unbroken to the shore of a lake. This picture was taken through glass windows in an amphibian.



FIG. 7—A ridge-top pasture clearing in an area of sparse occupance in south-eastern Costa Rica. Forest on the bordering slopes.

Canal. Huts and patch clearings in the forest like those in other districts, here most numerous near the artificial lakes, contrast sharply with the exotic works of the canal. Probably rural settlement has been stimulated at the historic crossing place, but close occupance does not appear among the dissected lateritic hills of the isthmus.

Sparse occupance east of the canal along the north coast of Panamá almost adjoins the Canal settlement, and yet is distinct from it. This is the San Blas district, where Indian villages occupy cays off shore, coconut groves fringe the beaches, and patch clearings of corn, cane and plantains are scattered through the forest on the mainland.

The string of cays comes to an end near the eastern boundary of Panamá and beyond this the scattered occupance near the coast in Colombia represents a separate settlement of patch clearings along valleys of the western slope of the Western Andes.

BLANK OCCUPANCE

There remain to be mentioned several blank areas between settled districts. Some of these are in lowlands and others in highlands. They include an interior area of the Yucatán peninsula (Fig. 6), separated from the coast by no barrier but distance; rugged forested slopes of northwestern

and southeastern Costa Rica; dissected forested mountains of western and eastern Panamá; and the bare crest of the western Andes.

A question might be raised as to the propriety of including a bit of the Andes in a Central American traverse. It is included in view of its affiliation with the Central American pattern of terrene occupance and as evidence against the sanctity of an orthodox boundary. Its inclusion is simpler than that of Yucatán. The traverse observations continued farther south, but here other factors appeared calling for discussion elsewhere.

CONCLUSION

It is evident that the traverse, following a zigzag course through Central America, touches various districts without indicating their extent or defining their relations to each other. The reconnaissance pattern is still to be completed. Yet from this one traverse a few generalizations may be suggested.

1. The grades of occupance, appearing like spectral bands along the traverse, may be thought to occur as segments of concentric rings centering in the principal separate communities of the region. But in this connection it is to be remembered that the distinction between grades generally is not only quantitative but qualitative and is based on local surface differences rather than on distance from a central nucleus.

2. The surface differences affecting habitability seem to be largely in distribution of precipitation, in ruggedness of land forms, and in maturity of soils. Areas of complete and close occupance appear only where there is evidence of both rainy and dry seasons and a preponderance of smooth land. With one exception they are in a belt of immature volcanic soils, high in some places and low in others. The one exception is in the limestone plain of Yucatán. In areas of sparse occupance there is conspicuous concentration of settlement in valleys on immature alluvial soils. Mature soils are conspicuously unoccupied except for pasturage in a few places.

3. The areas of complete and close occupance show marks of European culture in their towns and farms. In some areas of sparse occupance there is a European touch in plantations or grazing lands, but in most places there are marks of primitive culture in hut villages and forest clearings. In most of the areas of complete and close as well as in those of sparse occupance small-scale subsistence farming is more in evidence than large-scale commercial farming. Signs of productive activity other than farming are few and minute.

4. The distribution of the types of occupance along the traverse suggests the divisions of a political rather than of a physical map. In general the pattern accords with a concept of the Central American nations as

separate groups of people isolated from each other.⁴ But it does not substantiate the idea of the separation of these nations by natural barriers. National boundaries do not coincide with natural boundaries nor follow uninhabited zones, but cut through outlying communities. Therefore between these nations, based on major concentrations of population, boundaries apparently have not been set with respect to local barriers or population groups in the boundary zones, but have crystallized according to the relative political influence extending into these zones from more or less distant major centers.

*University of Chicago,
November, 1933.*

⁴ Robt. S. Platt: "Central American Railways and the Pan-American Route," *Annals of the Association of American Geographers*, Vol. 16 (1926), pp. 12-21.

Titles and Abstracts of Papers Evanston, 1932

FRANÇOIS E. MATTHES.

Our Greatest Mountain Range, the Sierra Nevada of California.
(Presidential Address. To be published in full in a later issue.)

WALLACE W. ATWOOD.

The Physical Setting of the Ancient Mayan Civilization in the Highlands of Guatemala.

The Old Empire of the Mayan communities developed on the highlands of Central America in a region of intense vulcanism. The southwest margin of that highland, facing the Pacific Ocean, is marked by a chain of volcanic cones of very recent origin. Scarcely a year passes without some one of these volcanic centers becoming active. During historic time cities and villages have been destroyed by earthquakes and associated outbursts from neighboring volcanic vents. Adjoining the chain of recent volcanoes there is a belt, 40 to 50 miles in width, composed chiefly of volcanic ash. At places 3,000 feet of fragmental, volcanic débris are exposed, but the maximum depth of such accumulations in the region is not known. Within the area of volcanic activity there is a remarkable caldera, 12 miles in diameter, in which Lake Atitlan is located.

In the late development of the physical landscape a number of distinct basin-like areas became filled with volcanic ash and the ruins of many of the ancient Mayan citadels are located in such basins. Modern Mayan settlements are now located within short distances of the sites of ancient temples where the grandeur of the older civilization is faintly represented in the landscape. In the walls of certain of the canyons cut into the ash-filled basins there is evidence of various stages or periods in the volcanic history of the region, and there is a possibility of finding deep below the surface a buried village or city.

Far off to the northward, beyond the belt of recent volcanic accumulations, there is an ancient massif of complex structure and very old erosion features. The physical landscape is playing an important part in the adjustments which the modern Mayans are making, and must have influenced the development of the ancient Mayan civilization.

WALLACE W. ATWOOD, JR. (Introduced by François E. Matthes.)

Glaciation and Land Utilization of the Park Range in Colorado.

The Park Range is a magnificent chain of mountains with several summits over 12,000 feet in elevation. Twenty valley glaciers and a small ice cap formed in this range during the Pleistocene Period. On the east side of the mountains the glaciers produced large moraines and small outwash deposits, while on the west side small moraines and large outwash plains were formed. Several factors combine to explain this condition, among which are exposure to the rain-bearing winds, and the difference in elevation between the lowlands to the east and west of the range. In addition to Wisconsin glaciation there is definite evidence of an older invasion dating probably to Durango time. The extent of the Durango glaciers is only slightly greater than those of Wisconsin age.

The land utilization of the Park and immediately adjacent lowlands is closely related to the relief and climate and to the character of soil material as determined by glaciation. Differences in exposure and elevation are clearly reflected in the land use of the Elk River Valley, as contrasted with that of North Park 1,000 feet higher. Practically all lands under cultivation in North Park are irrigated while only a portion of the Elk River lands rely upon irrigation waters. On both sides of the range the land used for agriculture is glacial outwash material. Correlations between the land use and physiography have emphasized several interesting relationships existing in this section of the Rocky Mountains.

C. E. BATSCHELET. (Introduced by Helen M. Strong.)

Geographical Analysis of Census Facts for the State of Tennessee.

Tennessee is strategically located for both industry and agriculture. It is almost the geographical center of 70 per cent of the total population of the United States. Located between the colder climate of the northern states and the warmer climate of the southern states, it is capable of producing a variety of products. Timber, coal, iron-ore, copper and phosphate rock, together with its cotton products and possible hydro-electric power development, make it possible to secure the necessary raw materials to manufacture and distribute many products at a low cost.

The state has an area of approximately 42,000 square miles, and a population in 1930 of 2,616,557. The rural farm population was over 1,200,000 and the farms numbered 245,000. 128,000 persons were engaged in manufactures in 2,800 establishments and there were 23,000 retail stores employing 64,000 full and part-time employees (excluding proprietors and firm members) engaged in retail distribution.

The limits of the nine principal areas of Tennessee, as outlined by Dr.

Nevin M. Fenneman, were adjusted to the minor civil divisions of the state and certain census facts, especially as they relate to population, manufactures, agriculture and distribution, were compiled for these areas.

These census data for the regional areas of Tennessee present very contrasting differences, and the character of the economic development throughout the state clearly reflects the influence exerted by the physiography in the various regions.

CHAS. H. BEHRE, JR., AND W. H. HAAS.

Geographic Aspects of Mineral Technology.

Technological changes, both minor and major, in the mineral industries, are frequently revolutionary in their ultimate effects and thus have very important geographic bearings. This relates especially to the estimates of available resources and their immediate exploitation. Typical technological changes involve in part mining methods, in part modes of extraction and utilization of products, and in part increases in the demand for by-products on the part of related industries. Such changes in geographic significance are exemplified in fields like copper production from "porphyry" ores; sulphur mining; the production of zinc concentrates; the cyaniding of gold ores; the extraction of nickel; by-product sulphuric acid manufacture and by-product arsenic trioxide recovery; the quarrying and preparing of slates and other building stones; and the cracking of asphalt-base petroleum.

RALPH H. BROWN.

Greenfields Terraces of the Sun River Project.

The undulatory steppe of the north Montana piedmont is interrupted at infrequent intervals by verdant irrigated areas conforming in position to the main streams which rise in the Lewis Range. The irrigated areas may be grouped into two classes: (1) the lowlands bordering the main streams and (2) the flattish interstream platforms. The Greenfields Bench lying west of Great Falls is an example of the latter class and is also a division of the Sun River Irrigation Project. The dominant features of the region are its exact delineation and its flat surface broken into three terraces which are now made almost entirely irrigable by an ingenious arrangement of canals and laterals engineered by the United States Reclamation Service.

The surface of the bench is now disintegrated by a mantle of green fields the boundaries of which are either formed by the artificial lines of straight roads and fences or the more natural lines formed by irrigation canals and drainage ditches. The one hundred and fifty square miles of occupied land contain only one small village (Fairfield) the population of the region being still relatively sparse for an irrigated region. Maps drawn in the summer of 1933 show that pasture land, and fields of tame hay and particularly

wheat, widely dispersed throughout the region, predominate in the cultural landscape.

The interpretation involves three considerations: (1) a certain degree of environmental unity except minor differences in soil types, (2) lack of a center of population and (3) the immature stage of regional occupation. The latter situation is the result of the recency of irrigation and a well-established dry-land culture antecedent to that irrigation. The maps for 1933 thus portray a unified region not far removed from the frontier, irrigation having introduced as yet few changes in the land economy of the region.

FRED A. CARLSON. (Introduced by Guy-Harold Smith.)

Surface Temperature over the Western Plateau Region of the United States.

The investigation of the distribution of surface temperature and its variations with altitude over the western Plateau Region of the United States embodies three major objectives; first, to determine the effect of altitude upon the horizontal distribution of surface temperature at different planes of altitude; second, to compare the variations of surface temperature at selected elevations with the temperature at selected elevations with the temperature at the same altitude in free-air over the level plains states to the eastward; and, third, to determine how accurately the average monthly temperatures at any particular single first order or climatological station within the plateau region, represent the true climatic conditions within that localized area, so far as temperature is concerned when compared to the average group of nearby stations, arranged according to similar planes of elevation.

The method of procedure involved the arrangement of the various first order and climatological stations into groups; each group including those stations situated within a limited vertical range of common altitude. In the initial stages of the investigation the adopted planes of elevation were for each hundred meters. After thus classifying the stations for which a sufficiently long temperature record was available, the stations were located upon a series of large base maps; one map for each month and for each adopted plane of elevation. On account of the scarcity of data for certain elevations in some areas, it was found necessary to combine the records into 250-meter differences in altitude, in order to obtain the proper horizontal distribution of stations over the plateau. Then, isotherms of the average monthly temperatures for each of these elevations were drawn. Profile diagrams were constructed, showing the altitudinal cross-sections along the 35th, 40th, and 45th parallels of latitude, together with a scale showing the corresponding variation of temperature with elevation over the plateau and mountainous regions and the average free-air temperatures for

similar elevations over the adjacent plains. The preliminary results show that surface isotherms connecting rather widely separated stations and drawn without regard to their great variation in altitude do not give a true representation of the climatic conditions associated with the temperature of a given region, in the same sense as those drawn between stations over comparatively level country. Records also show that the temperature data for a single station in a mountainous region do not correctly indicate the average temperature conditions of the atmosphere overlying that particular locality. A comparison of the vertical temperature gradients over the plateau and mountainous region and the average free-air temperatures for similar elevations over the plain seems to indicate that the temperature of a column of free-air may be a more accurate expression to apply to the correction of atmospheric pressure than a temperature gradient.

KIRK BRYAN AND R. G. HOSEA.

Tamarisk—An Introduced Plant and Its Geographic Effect.

The ornamental shrub tamarisk is a native of Europe and Asia. More than twenty-four species have been introduced for horticultural purposes. One of these introduced species, *Tamarix gallica*, has gone wild in the valleys of Pecos River (previous to 1915), Salt River (1920 \pm), Rio Grande (1927) and Arkansas River (1930 \pm). The growth of this plant which is resistant to drouth, alkali, and grazing has had and will have large effects on the processes of erosion and sedimentation of Southwestern rivers. On the Rio Grande the spread of the plant is associated with the flood of 1927. Either a seed crop produced in the valleys north of Española and Santa Fe was carried down by this flood or a seed crop originating in the San José drainage near Acomita and Laguna was carried by Rio Puerco into the Rio Grande. The evidence favors the San José as the source of this seed crop.

The presence of free-seeding tamarisk affects the stability of banks and the efficacy of works intended to control and improve channel conditions on the Rio Grande. The thick bushy growth of the shrub and the spreading root system make it an aid in protecting banks from scour and in consolidating fill induced by permeable dikes. On the top-set beds of deltas the growth of tamarisk promotes additional deposition and increases the volume of silt deposited as top-sets. This effect has extended the useful life of MacMillan Reservoir in Pecos River. The same effect may be expected on the delta of Elephant Butte Reservoir.

The favorable aspects of the spontaneous growth of Tamarisk are counterbalanced by the deleterious effects on drain ditches and canals. Cleaning these structures will be much more difficult if they are overgrown by tamarisk. On the whole, however, the effects on the works of man may be

beneficial, and the general effect on minor streams while not entirely predictable will probably compensate for any disadvantage to other waterways.

PHIL E. CHURCH. (Introduced by C. F. Brooks.)

Dynamic Climatology.

Dynamic climatology, in contrast to statistical climatology, may prove more satisfactory as a basis from which to make climatic interpretations. The phases which are of interest to the geographers are the characteristics, frequency, seasonal distribution, and duration of distinct air masses. The properties of these air masses are contingent upon their source regions; *e.g.*, polar or sub-polar, or tropical, continental, or marine. The source region imparts to the over-lying air the characteristics which are quite stable even after the air mass moves to another region.

The extra-tropics lie in the broad zone of conflict between polar and tropical air masses. The rapidity and degree of changeableness of the weather depends upon the succession of the different types of air masses. There are three polar and four tropical types which are named for the region which impresses definite characteristics upon the air. Thus, there is the polar continental, polar Pacific, and polar Atlantic, tropical Gulf, tropical Atlantic, tropical continental, and tropical Pacific. All tropical air masses are warm and all are very moist except the tropical Pacific. The tropical Atlantic and tropical Gulf, both very humid, bring the moisture to that section east of the 100th meridian. The tropical continental is hot and dry during the summer, its season of maximum occurrence.

In contrast to the tropical, the polar masses are cool or cold. The polar continental is very cold and dry during the winter and cool in summer. The polar Pacific mass loses its moisture on the western coast and becomes quite dry on reaching the interior of the United States. The polar Atlantic is cold and moist during spring and fall when it is most frequent along our northeast coast.

Each of these masses becomes somewhat modified after leaving its source region and when the characteristics have undergone a large enough change the mass is then designated as transitional. Thus there are more than a dozen types of air masses. The passing of different types of air masses produces weather changes which are far from the average. These changes are probably of far greater importance in determining and restricting man's activities in his adjustment to the environment than the averages that these wide and rapid changes produce. Many agricultural, industrial, economical, and human adjustments to the environment can be better interpreted with a more complete understanding of the properties, frequency, seasonal distribution, and duration of the air masses.

WILLIAM S. COOPER.

Types of Pacific Coast Dunes.

In the course of the present study all important dune areas upon the Pacific coast of North America have been investigated from northern Baja California northward. Areas of special development occur in the vicinity of Coos Bay, Oregon, Monterey and Santa Maria, California, and Socorro, Baja California. Dunes occur mainly where the coast line is so oriented as to face the prevailing northwest winds of the summer dry season.

Dune formation is fundamentally independent of vegetation, although in the region concerned vegetation is inextricably involved in the developmental process. Sand blown from the beach forms small barchane-like masses, which grow in size and merge with one another. The dune complex is produced through overtake of the older ridges by the younger. On the Pacific coast, the final forms are moulded by alternating action of summer and winter winds, which in the north are almost in opposition.

Several special types of dunes are described: foredunes, directly due to accumulation around plants; barrier dunes, narrow complexes developed from foredunes; systems of straight, symmetrical ridges parallel to the shore, the origin of which is not yet understood; cliff or perched dunes.

Extensive dune complexes acquire definite characteristics which differ with differing climate and vegetation. Under desert conditions, in Baja California and Sonora, because of scantiness of vegetation, the configuration of the dune surface gradually softens with stabilization. In California, under a moderately arid climate and fairly dense shrub cover, topography is still characterized by softening of contours. When rejuvenation occurs, the vegetation offers little resistance to sand invasion and is soon overwhelmed. In Oregon, under heavy precipitation and luxuriant forest growth, resistance of the vegetation to both burial and undermining results in the development of a complex characterized by rough topography. With rejuvenation, certain patches of forest hold their own for long periods, standing out as islands in the sea of sand. Reinvasion of denuded areas by vegetation is very rapid.

FLOYD F. CUNNINGHAM. (Introduced by A. E. Parkins.)

Muscle Shoals: A Keystone in a National Plan.

One of the most conspicuous feature in the cultural landscape of the Middle Tennessee Valley is a great monolithic structure known as Wilson Dam. Near the Dam are two large nitrate plants and a steam plant. The region is known as Muscle Shoals, the name originally applied to 37 miles of shoals in the Tennessee River. Muscle Shoals, which has for a century been a two-fold barrier to the progress and development of the Tennessee

River and the Valley through which it flows, is at last to become the key-stone in a national plan. The struggle of the people of North Alabama for the development of the Tennessee River, first for navigation only, then later for both navigation and hydro-electric power as means of utilizing the resources of the immediate area, is an epic which began more than a century ago. The Shoals first figured in legislation in 1824 when President Monroe, basing his message on a report from his Secretary of War, John C. Calhoun, asked congress to make plans for rendering the Tennessee River navigable over the Shoals. Little work was accomplished although two million dollars were spent on the project. Between 1877 and 1890, four million more dollars were spent on a new scheme of canals over Muscle Shoals. These efforts, too, were dismal failures. Survey after survey since 1890 have been made by U. S. engineers at a cost of several million dollars.

The war clouds of 1916 led to a decision by Congress to build canals around and over Muscle Shoals and two nitrate plants for the manufacture of nitrates in time of war and fertilizer in time of peace. To furnish cheap power for these plants Wilson Dam was conceived. It was completed in 1925 at a cost of \$47,000,000. In addition an 80,000 H. P. steam electric power plant was built in advance of the construction of Wilson Dam, as a war-time emergency power supply for operating Nitrate Plant No. 2 for the production of nitrates. An Act of Congress, passed on May 28, 1933, creating the Tennessee Valley Authority represents the first deliberate effort on the part of the Federal government to systematically plan and develop the economic and social life of any regional environment in America. The heart of the ambitious plan is Wilson Dam and the two nitrate plants. Muscle Shoals, however, is but a single unit of an integrated plan for making the Tennessee Valley a better place for human habitation. The power development of war days involving only Muscle Shoals led logically to national planning for the entire valley involving several states and the future lives and welfare of more than two million people. Reforestation, afforestation, flood control, release of sub-marginal agricultural lands, urban planning, and fertilizer production are to be effected under the plan of the Federal government.

DARRELL HAUG DAVIS.

Some Aspects of the Occupation of Hokkaido.

The name of the "Hokkaido" is derived from the official name "Hokukai-dô" (Northern Sea Way), formerly applied to Ezo-ga-shima and other nearby islands, one of the early, non-administrative divisions of the Japanese Empire. Active Japanese interest in the Hokkaido is of relatively recent origin; not until 1800 did Japanese maps show even the outlines of the island correctly, and even at that date, the interior was almost unknown

and completely unmapped. The Hokkaido is still the "Northland" to Japanese and the earlier, erroneous beliefs as to climatic conditions and crop possibilities even today act as deterrents to immigration.

The initial, semi-military occupation in the Hakodate Peninsula was based on fisheries and the population was in considerable part migratory. As late as 1869, the Japanese population was only 105,108 persons, but with rail construction shortly thereafter, immigration increased to a maximum of 77,000 persons per year between 1916-1920. At present, the rate is distinctly less and the center of population, after advancing in an easterly direction for many years, has begun to shift south-southwest as immigration into the less promising areas of the east and northeast has been offset by biologic increases in the better areas of the west.

In the Hokkaido, agricultural settlement away from the seaboard follows rail construction. As most of this construction has been very recent, only a few years separates present and past everywhere and in certain areas all stages of occupancy occur within a few miles, a fact of great interest to the geographer.

Though agricultural practices reflect climatic conditions, rice is the dominant or most important crop in most agricultural areas. The perfection of a variety which will mature in a 90 day frost-free season and which gives satisfactory yields of fair quality makes this possible. Upland farming differs considerably from that of the southern islands as to crops, the relative importance of the various crops and the importance of the animal industries. The densest populations concentrate in those areas most favorable for rice production—in the west and southwest.

The present population of the Hokkaido is slightly more than 2,900,000; the Hokkaido Government expects, that when fully developed, the island will support 6,000,000 persons. As the agricultural area is already almost completely occupied, increased urban development must care for most of this anticipated population increase. That the land will support 3,000,000 persons directly is probable; that industry can be expanded to increase the present urban population of approximately 800,000 by over 2,000,000 persons is very doubtful. It does not appear probable that the Japanese can any longer use the Hokkaido as an outlet for the surplus population of the southern islands; Hokkaido itself will have its own surplus population problems within a few years.

SAMUEL N. DICKEN. (Introduced by D. H. Davis.)

Galeana: A Mexican Highland Village.

Galeana, a village of 1,600 inhabitants is located in southern Nuevo Leon at an elevation of 5,300 feet. In this district the Sierra Madre Oriental may be described as a series of roughly parallel ridges and valleys,

trending N 20 W with the strike of the highly folded and faulted limestones; thus the ridges appear as *cuestas* or hogbacks, rising in some cases more than 3,000 feet above the valleys. Two features are of essential importance in the site of Galeana: the broad flood plain and the natural, spring-fed lake two miles west of the village, which supplies most of the water for irrigation. The lake occupies part of an elongated solution depression which in the Slovene karst terminology is called a *polje*, and there are many other small solution basins. The cultivated area coincides with the flood plain and takes the form of a crescent, the upper part in the tributary valley, the lower part in the main valley below the village. In the summer nearly all the land is in maize, in the winter about one third is planted in hard red winter wheat. Other crops are beans, tunas (cactus "apples"), maguey (for pulque), apples, peaches, quinces, figs, tobacco and potatoes. The maize, beans, tunas and maguey are old staple crops, cultivated since the founding of the village in 1654; the others are fairly recent introductions. Some of the apples, tunas and wheat are exchanged with Linares, a town 40 miles eastward and down 4,000 feet, for manufactured articles, sub-tropical fruits and, in lean years, for additional maize. The lands around the village are tilled by peon share-croppers, who return a third to a half of the corn to the owners, most of whom live near the plaza in the village. Irrigation by means of diversion canals is greatly facilitated by the gradient and smooth character of the flood plain. The village proper is located at the confluence of two arroyos, one of which is usually dry. In the vicinity of Galeana, there are other settlements, haciendas, ranchos and villages which derive water from underground sources, alternate summer maize with winter wheat and aside from land tenure and management fit into a common regional pattern.

V. C. FINCH.

Reconnaissance Notes on the Geography of the Mississippi Delta Fringe.

This paper reports the results of a two-day reconnaissance study of the forms, patterns and associations characteristic of the human occupancy of the levees bordering the distributary bayous of the Mississippi delta fringe. The entire region is low and settlement is confined to levee land less than 20 feet above sea level. The landscape includes cleared farm land, the remnants of fresh-water-swamp forest and great expanses of salt-marsh grass. Occupance of the broader up-delta levees is mainly agricultural. The width of the greater levees early made possible a plantation agriculture which is now concerned mainly with sugar production. Sugar-mill villages, old plantation mansions, the homes of small farmers and transportation equipment for moving sugar cane are ranged along the levees or stretch back to a persistent woodland fringe of fresh-water swamp.

The widening bayous, as they open out toward the coast, have narrowing levees that taper to points and disappear in the salt marshes. Here the levees are too narrow for plantation agriculture and woodland closes in upon the scene. However the bayous are navigable and the interest of the inhabitants turns from the land to the sea. Water craft are here more numerous than land vehicles and every house has its house-boat on the bayou. In these the inhabitants may escape the danger of flood or move to their muskrat-trapping grounds in the salt marshes. During the period of their residence in the small, unpainted and often unscreened houses on the wooded levee the inhabitants till gardens and put out in their motorboats for shrimp fishing.

V. C. FINCH.

Written Structures for Presenting the Geography of Regions.

(To be published in full in a later issue.)

EDWIN J. FOSCUE. (Introduced by W. E. Ekblaw.)

Geographic Factors in the Development and Decline of Skagway, Alaska.

Skagway lies halfway between the Klondike gold fields and Seattle, on a mountainous fiorded coast which provides little level land for settlements.

Situated on a delta at the head of Lynn Canal, one of the major fiords of southeastern Alaska, the town occupies a strategic position at the innermost margin of ocean navigation. Back of Skagway lies White Pass, the lowest crossing of the continental divide between the Pacific Ocean and the headwaters of the Yukon river. To the westward, back of Dyea, the Chilkoot pass rises more than 1,000 feet higher in crossing the same divide. Situated in the west coast marine climatic belt, the protected site of Skagway gives it only a fraction of the normal precipitation of more exposed stations. Summers are warm and winters moderately cold except on the summits of the passes where sub-zero temperatures are common.

Discovery of gold in the Yukon brought men from all parts of the world. The shortest route to the gold fields is by boat from Seattle to the head of Lynn Canal and over one of the two passes to the headwaters of the Yukon. With the discovery of White Pass Skagway replaced Dyea as the port of entry and gold seekers entered the town, soon followed by the building of a trail, and ultimately the White Pass and Yukon Railroad over the pass. Skagway then became the chief port of entry to the Klondike and grew rapidly to between 15,000 and 30,000 during the height of the rush in 1898. Boundary disputes arose between Alaska and Canada, leaving Skagway a town practically without a country. Finally the boundary was placed at the summit of White Pass, making Skagway an Alaskan settlement, although still the chief port for the Canadian Klondike area.

The decline began in 1900 with the discovery of gold in the beach sands at Nome, which diverted the stampede from the White Pass-Yukon trail to an all-water route from Seattle. The construction of the Alaskan Railroad from Seward to Fairbanks, tapping the productive American section of the Yukon Valley shifted more traffic from Skagway. Finally the World War took its quota of young men who did not return.

Today Skagway appears as an almost deserted village of less than 400 people. Still a port for the White Pass & Yukon R. R., served by three regular steamers, carrying freight and as many as six hundred tourist passengers each week during the summer season, the town benefits little from this traffic, as most of it moves on over the pass by rail. Were modern hotels built the scenic attractions of the immediate area might influence tourists to stop over in the town, but unless these facilities are provided Skagway will continue to shrink.

REUEL B. FROST. (Introduced by George D. Hubbard.)

Lorain, Ohio: A Study in Urban Geography.

Lorain, on the lake-plain at the mouth of the navigable Black River 70 miles east of Toledo and 200 miles west of Buffalo, is a city of 44,500 people, representative of the lower lakes cities with a coal export and iron import trade, and manufacturing. It has developed through the same sequential stages of human occupancy as other commercial and industrial cities on Lake Erie.

The Lorain site has had at least 125 years of human tenure during which time it has been occupied by the Indian; has experienced the stimulus of port activities during a formative period of early white settlement; was stimulated to growth during the early period of agricultural expansion and development; has been subjected to commercial adversity and urban decadence when the railroads first came; and has experienced a complete revival of trade and a phenomenal modern industrial development in later years. These changes have produced manifold urban forms, have changed the urban functions and have been the means of producing a changed urban pattern. Modern Lorain dates from 1894 when the Johnston Steel Company located near the city. Since that time the city has grown 815 per cent in population.

The land used by the heavy industries and that devoted to transportation stand out prominently. The dominating cultural forms are those related to heavy manufacturing and the transshipping trade. With an average annual import of 3,000,000 tons of iron ore, about 50 per cent of which is reduced locally and the remainder transhipped; with 4,000,000 tons of coal entering for transshipment and local use, the city has become bi-functional. But the high percentage of urban land used for residence and the dependence of its

residents upon heavy industries, show the present city to be the home of the industrial worker rather than a city dominated by the transshipping trade. At least 60 per cent of the population of Lorain is dependent directly or indirectly upon the heavy industries.

ROBT. M. GLENDINNING. (Introduced by Stanley D. Dodge.)

The General Aspects of the Distribution of Population in the Lake St. Jean Lowland, Province of Quebec.

Approximately one hundred miles north of Quebec City is an island of population occupying the lowland which encircles Lake St. Jean. The widespread occupation of this area dates from the year 1851. Since that year the settlement has encircled the lake, but in so doing has chosen chiefly the portions of the lowland with adequately drained clay loam soils, with the result that large blanks appear on the population map in places where conditions are swampy or very sandy. The population pattern, a linear, disconnected one, correlates with the road pattern which in turn is largely determined by the system of survey.

OTTO E. GUTHE. (Introduced by Preston E. James.)

Occupance Patterns in the Black Hills.

The Black Hills possess an insularity which separates them, both physically and culturally, from the encompassing plains. Four chief modes of occupance—mining, ranching, lumbering, and recreation—have characterized the course of settlement within the region. The arrangement of the landscape features of each of these modes produces an individual pattern. The physical background upon which these patterns have been impressed is a group of low mountains developed on a domed structure. Differential erosion has produced four distinct surface divisions: an Interior Basin; a Limestone Plateau; an Inner Lowland, and an Outer Rim of in-facing cuestas. Mining is concentrated within the Interior Basin, where the mineralized zones are found. Ranching is concentrated on the relatively level areas of the Inner Lowland and the adjoining plains, particularly on the broad alluvial flats where rich soils can be irrigated. Lumbering is confined to the more accessible portions of the Interior Basin and the Limestone Plateau. The material forms of recreation are along the main highways in the eastern part of the Hills. The regional reality of the Black Hills, with its strongly marked insular character, comes from the blending of these patterns, each having been developed in harmony with the features of the physical background.

WILLIAM H. HAAS.

Foundations and Limits in Geography.

Knowledge comes but wisdom lingers. The accumulation of information in any science is a relatively simple process and has many followers; but the discernment of the true and the right in their relationships is far more difficult and is reserved to a much smaller group. Specialization to some means an ever concentrating and narrowing down of interests to some single phase of a subject; to others it means ever broadening fields in research interests with a limited goal ahead. Among opinions solicited (not for publication) from some of our leading geographers there is a fairly wide range of opinion relative to foundations and limits in geography in their relation to sound geographic thinking.

RICHARD HARTSHORNE.

The Upper Silesian Industrial District.

This is an area of concentrated mining and heavy manufacturing extending across the pre-war German-Russian frontier as well as the present German-Polish frontier. It is both small and compact in development, its major part forming a single conurbation. The pattern of urban landscapes developed on a nearly level plain without navigable waterways is scattered and complex. In place of one dominant center there are six co-ordinate centers. Sharp boundaries mark the district off from the surrounding farm and forest landscape. Within the district the landscape is dominated by the various features of mines, heavy industries, general urban development, and a complex net-work of different transportation services. Most important are the mining features, including many open pits and quarries, but particularly the surface manifestations of large underground mines, some for zinc, but most for coal. Manufacturing features are largely limited to those of a few heavy industries, notably those of iron and zinc. The most important, the iron and steel industry, shows definite signs of decline, such as abandoned blast furnaces, reflecting the declining production of the local brown iron ores and the inferior quality of the local coal. Industries other than those closely associated with the local mining, notably those of light manufacturing, are strikingly unimportant. The associations of individual plants shows no carefully planned development. Similarly the urban areas are mostly chance agglomerations of poor "workers' colonies" enclosing the industrial lay-outs in curiously formed cities. Residence districts are for the most part poor and unattractive even for a manufacturing district, and the contrast with estates of the few owners are even greater than in similar districts. The former Russian-Polish portion is notably inferior in the character of its urban development and in relation to all transportation con-

nections remains sharply separated along the "antecedent boundary," now abandoned. The "superimposed boundary" which now divides the German and Polish portions of the former German area is much less effective as a communications divide.

In analysis the landscape is seen to have developed on the basis of the following factors: limited deposits of galena and brown iron ores easily worked but now largely exhausted or superseded; larger deposits of mixed zinc and lead ores, worked to full capacity; rich, easily worked beds of bituminous coal of excellent quality, excepting for coke, which are worked only in the small part of the field in which mining conditions are most favorable; the pre-industrial landscape of a sandy-soiled forested plain, lacking in water power, and remote from commercial areas, and thus little developed in agriculture, commerce, or pre-industrial manufacturing; the remote inland location of the area on the eastern periphery of commercial Europe; and its peculiar political location in an international border corner.

ROBERT BURNETT HALL.

Some Urban Forms in Japan.

Most of the cities of Japan and all of the larger ones occur in a narrow belt on or near the shores of southwestern Japan, between Tokyo and Nagasaki. More than half of Japan's present cities (shi) and also a large proportion of the towns (machi) were castle towns in feudal days. The morphological and functional plans of such cities and towns are distinct, as the street pattern and the distribution of certain land uses are definitely adjusted to the castle grounds and moats and to the defensive needs of the old castle.

The commercial towns (machi) of olden days were of two main types, *i.e.*, market towns (ichiba) and post towns (shikuba). Many of these have developed into modern cities and important towns and still retain their attenuated form.

A third type was the religious center, either a temple town (monzen) or a shrine town (torii). The form of this type is determined by the arrangement of roads leading to the temple or shrine.

Few cities or towns, however, had but a single function. Practically all had two and many had three. Osaka for example was a great castle town as well as an important commercial center. Tsu was a castle town, the greatest of the shrine towns, and was also the commercial center of the Ise Plain.

Matsue and Iga-Ueno are presented as examples of the castle town. Nara and Tsu are examples of religious centers. There are many fine examples of commercial and transport centers.

WILLIAM H. HOBBS.

Discovery of a New Sketch of Cape Hudson in the Antarctic.

On January 19, 1840, Lieutenant Charles Wilkes, of an American Exploring Expedition, discovered land within the Australian sector of the Antarctic region, and this land he charted and named Cape Hudson, though land was believed to have been seen three days earlier. Continuing his cruise westward he made landfalls in the vicinity of the Antarctic Circle at intervals throughout a distance of some 1,700 miles, and he found evidence that these landfalls represented the coastline of an Antarctic continent.

Various explorers and geographers, mainly British, have challenged these discoveries, and in 1904 Captain R. F. Scott in the *Discovery* sailed near enough to the charted position of Cape Hudson to show that if a real landfall, it was put upon the map in the wrong position. Sir Douglas Mawson, who cruised within the same sector of the Antarctic in the years 1929-1931, found land near the positions charted by Wilkes with the exception of the extreme eastern and western landfalls, though his charted positions are in general some 40 to 70 miles farther to the south than those of Wilkes. Such discrepancies in estimation of distance, necessarily made because of the marginal pack ice, are to be explained by the astounding visibility in the transparent air of the Antarctic in combination with looming, which brings features below the horizon into view (Hobbs, *Geographical Review*, October, 1932, and *Geografiska Annaler*, 1933, hefts. 1-2). Mawson's work has thus confirmed the discoveries of Wilkes for some 1,500 miles, and at least for the coast between longitude 105° and 150° E. (Professor Frank Debenham, *Geographical Journal*, vol. 81, February, 1933, pp. 145-150).

Doubt has, however, been expressed concerning the reality of Wilkes's discovery of Cape Hudson, for the reason that no land has yet been found nearer than Cape Freshfield of King George V Land, fully 140 miles further away, with the higher part which alone would come into view probably 200 miles distant from Wilkes's ships. The British exploring ship, *Aurora*, Commander Stenhouse, was on November 23, 1915, in about the same position as Wilkes's ships on January 19, 1840, and Cape Hudson was seen from the *Aurora* in the same direction and sketched by more than one on board. One of these sketches has now been found, and on comparison with that made from Wilkes's ships, is found to be almost identical. With the approval of Commander Stenhouse this sketch is reproduced (*Geographical Review*, January, 1934). Thus confirmation is found for the discovery of the Antarctic continental land by Wilkes on January 19, 1840, and his Cape Hudson of that date is the Cape Freshfield explored by Mawson nearly three-quarters of a century later. On the day Cape Hudson was sketched from the *Aurora* at a distance of 200 or more miles, Young Island to the eastward some 225 miles distant was similarly raised into view by

mirage and a sketch of it appears on the same sheet on which that of Cape Hudson appears.

BERT HUDGINS. (Introduced by W. E. Ekblaw.)

Human Occupance of the St. Clair Delta.

The St. Clair delta is somewhat of an anomaly both as to its physical nature and its occupance by man. It is typical in structure but instead of being located at the mouth of a silt laden stream with occasional floods, it has been formed in a small lake at the mouth of a strait only 40 miles long and flows from a great lake. The fluctuation in mean water-level is only 18 inches annually. In its occupance by man one portion is devoted to permanent homes of 1,000 backward Indian people, and another part is used mainly as a summer resort by white men who know little of the lives of the Indians, and whose numbers vary from a mere 200 in winter to 6,000 in summer.

The international boundary extends through South Channel dividing the 100 square miles of the delta almost equally between Michigan and Ontario. The four classes of land use observed on the islands are Summer Cottages, Permanent Homes, Commercial Resorts, and Hunting-Fishing Range. Summer cottages are for the most part located on low ground bordering the channels and on the United States side. High class summer homes are found on the upper, better drained, elevated land reaching a height of about 10 feet above water level at the apex of the delta. Because the Canadian side of the delta is Indian Reservation, few white men's cottages are found there. Permanent homes, located on the upper interior wooded portions consist of scattered Indian farm homes on the Canadian side, and a few more prosperous farms of white men in the interior of Harsen's Island, on the United States side. Commercial Resorts are restricted to the United States side of South Pass, facing the international boundary. The channel is the main passage-way for traffic through the straits, and is therefore suited for hotels, golf courses and amusement parks. Hunting-Fishing Range, the fourth and last land use division, occupies the outer lower portions of the delta and covers more than half its total area. Cat-tails, rushes, and marsh grass make an excellent feeding ground and cover for wild fowl here. Numerous club houses are located in these flats, and many private hunting parties resort to the area in hunting season.

Lack of floods favors a complete use of the lands of this low fertile delta. Annual ice jams in the channels prohibit bridges and therefore make land connections possible only by use of the ferry. This last fact has probably handicapped the development of truck farming. The Indian Reservation has a poor market both at home and across the border. The demand for summer resorts among the many people of the Detroit metropolitan area,

only 35 miles away, has resulted in making the islands and channels of the United States side of the delta a playground of increasing importance.

PRESTON E. JAMES.

The Terminology of Regional Description. (To be published in full in a later issue.)

MARK JEFFERSON.

The Problem of the Ecumené—the Case of Canada.

The essential part of a country—its people—is often intimately associated with only a part of the national territories, the *ecumené*, which excludes all waste, unused and unoccupied places. These may vary from 18 per cent for the United Kingdom to 31 for Switzerland or Japan, to 33 for the United States, and 90 per cent for Canada.

The *ecumené* is the house that enshrines the nation, the developed land owned by the nation and also lived on and used by it. All the cities are on it and the towns, even most of the villages. Almost the totality of the farm-lands and forest clearings are on the *ecumené* as well as the roads and railways. Isolated villages or isolated homes in the wilderness are bits of the country, their sites bits of the *ecumené*, but the wastes themselves are not parts of the country. They are merely national territory.

To determine the exact area and outline of the *ecumené* is very difficult. The railway map is a great help. Networks of roads or railways are always within the *ecumené*, though single tentacle lines may extend across the wastes. The completely drawn cities-map, when it is possible to make one, is the best means of approach to an accurate delineation.

But however difficult it may be to draw the outline of the *ecumené* its entire omission leaves the map of any country unfinished.

W. L. G. JOERG.

The Warsaw Meeting of the International Geographical Congress.

(A statement of plans for the Congress to be held in September, 1934, by the Secretary of the American Section of the International Geographical Union.—Ed.)

DOUGLAS JOHNSON, J. HOOVER MACKIN, AND ARTHUR HOWARD.

Geomorphic Studies in the Rocky Mountain Region of Wyoming.

In connection with coöperative investigations in the Big Horn Basin and Yellowstone Park, initiated by Professors Field and Thom, of Princeton University, the junior authors have been engaged in intensive geomorphic studies of the region under general supervision of the senior author. An effort is being made to unravel the complex history of the

Grand Canyon of the Yellowstone, which has experienced one or more periods of filling since the canyon was first cut. The causes of canyon filling, and the possible rôle played by lava dams, glaciers, landslides, and other factors, are being studied.

The streams traversing the Big Horn Basin have valleys which are beautifully terraced, and the high divides between streams are gravel-capped mesas. These surfaces are interpreted as the product of lateral corrasion by heavily laden streams, which have carved inclined rock planes and veneered them with gravel. The gravel is in turn frequently buried under a mantle of slope wash varying in thickness from a few inches to nearly a hundred feet. The deposits of slope wash are sometimes preserved after the valley walls from which they were derived have been completely destroyed. On such evidence we can reconstruct highlands where we now have lowlands, and show that rivers flowed over what are now high-level divides. The former course of the Shoshone River is traced, with some precision, and the possible significance of terraces and mesas as evidence of uplift of adjacent mountain ranges is considered.

WELLINGTON D. JONES.

Procedures in Regional Investigation. (To be published in full in a later issue.)

WELLINGTON D. JONES AND HENRY M. LEFFARD.

Population Map of Metropolitan Chicago.

It is believed that a large-scale detailed density-of-population map of Metropolitan Chicago will reveal effectively (1) the limits of the urbanized area and (2) striking local differences in density within the urbanized area. It further is believed that these differences probably can be correlated with various phenomena of interest to geographers, sociologists, economists, and other investigators.

Population data for the 1930 Census are available by enumeration districts, which districts differ considerably in areal extent, but which run approximately 20 to the square mile where the city is closely built up. An excellent recent topographic map on a scale of 1:24,000 covers most of the part of the metropolitan area which lies in Illinois. Other more or less satisfactory maps are available for the remaining territory within a radius of 50 miles of the Central Business District of Chicago.

The procedure adopted for the construction of the density of population map is as follows: (1) As a base for the manuscript map of population density the various maps available are photographed up to an appropriate scale (1:6,000 within the urbanized areas). (2) Boundaries of enumeration districts are copied onto the base from manuscript maps of various

scales. (3) Areal extent of each enumeration district is measured by planimeter. (4) Tracts of more than 1 block (approximately 1/100 square mile) in extent which are in parks, railroad yards, factories, schools, and other "non-populated areas" are excluded from the determined areal extent of enumeration districts within which they lie. (5) Population density per square mile is then calculated and entered on the map, which is to consist of sheets each representing a square two miles on a side. (6) From this "fundamental population density map" density figures will be transferred to a smaller scale (perhaps 1:24,000 or 1:62,500) base map, isopleths drawn, and appropriate symbols spread over the map to show whatever grades of density may be desired.

HENRY MADISON KENDALL.

The Population Pattern of the Pays du Gers, France.

On the generalized population map of southwestern France, the Pays du Gers appears simply as an area of population density intermediate between that of the Garonne and the Adour lowlands on the one hand and that of the plateau of the Landes on the other. A study of the distributional details is necessary before this map has real significance.

The population of the Pays du Gers is dominantly agricultural. The outstanding fact of its distribution is the concentration of people in towns and villages. These nuclei occupy three types of sites: 1, the gently sloping valley sides at the edge of the present flood plains; 2, the hilltops; and 3, the crests of the steep valley sides. Where the surface is maturely dissected, the towns and villages are more numerous and closer together than they are where the surface is youthfully dissected. The remainder of the population is arranged about these centers in a manner largely dependent on the position of the roads. With respect to road position, a mature surface imposes fewer limits than does a youthful one. In the northern part of the Pays du Gers, the surface forms are mature while, to the south, they are youthful. Consequently, there is a more even spread of all of the population throughout the northern and eastern parts of the area than there is in the southern part. No sharp break exists, however, between the patterns of these parts.

CLARENCE E. KOEPPE. (Introduced by C. F. Brooks.)

Meteorological Conditions and Wheat Yields in Ford County, Kansas.

The meteorological conditions at Dodge City, Kansas, are assumed to be representative of Ford County. Correlations of those conditions with the yields of wheat per acre in that county reveal that April is, in general, the most critical month, closely followed by October.

Low minimum temperature in April seem to be followed by high yields

of wheat the following summer. Cool nights in June also tend to favor higher yields, and the same appears to be true for October. High maximum temperatures in both October and April are followed by lower yields the next summer. This is slightly true for May also. Relatively dry Aprils seem to be desirable; and the yields are larger when the fall months have normal precipitation. Frequent rainy days in both August and October are reflected in the higher yields the next season. That is, a thoroughly soaked soil in August followed by an autumn which is normal in respect to temperature and rainfall conditions seems to be the optimum condition for a good crop of wheat the following summer. Strong winds are almost invariably detrimental, and particularly so in September and March; and even in May and June an abnormally large wind movement affects wheat adversely.

There seems to be little or no correlation between wheat yields and the conditions of temperature, rainfall, wind, and even snowfall from November to February, inclusive. In fact, at Concordia the December snowfall showed a negative correlation of .48 with the wheat yields in Cloud County the following summer.

The meteorological conditions are too complex and too conflicting to permit more than a broad interpretation without entering into almost interminable multiple correlations. The general conclusion is, however, that a cool October with rather dry air but frequent small showers and that a cool and sunny April with a small amount of precipitation but relatively moist air (*i.e.*, a small precipitation-evaporation ratio) and with few rainy days, favor good yields of wheat the following season.

C. F. MARBUT.

Land Classification and the Soil Survey. (No abstract received.—*Ed.*)

LAWRENCE MARTIN.

The Newly-Discovered Marco Polo Map.

The Marco Polo map is a manuscript on parchment, rolled on a piece of bone, with a hitherto-unknown outline of Asia on each side. Through the generosity of Mr. Marcian F. Rossi, of San Jose, California, its fortunate owner, and the coöperation of Mr. W. J. Wilson, associate editor of the census of classical and medieval manuscripts in the United States and Canada, the Division of Maps in the Library of Congress was permitted to photostat this cartographic manuscript in 1933. The map on the *recto*, with a title in an oval cartouche, seems to have been based upon the geographical information contained in a letter from Marco Polo to his daughter Moretta. Studies now in progress indicate that it may turn out that this map was either drawn early in the fourteenth century by the daughter of the world-

famous Marco, or drafted for her, or else copied two or three centuries later from one so drawn. Its title ("Viaggio de Venetia ad Acra in Persia et da Acra a Campalu [Peking, China] per terra et mare facto da Polo Maffeo Nicolau et filiu Marcu mercatori et marineri Venetiani . . .") sufficiently indicates the scope of this map. The representation of Asia on the *verso*, also interesting geographically, is doubtless of later date. It contains place-names in Chinese ideographs, probably lettered by a non-Chinese individual, and has an unfamiliar longitude net, divided into units of seven. In the course of the year 1934, facsimiles of both maps, and a more specific statement respecting them, are to be published under the auspices of the chair of geography at the Library of Congress.

A. E. PARKINS.

Navigation Improvements on the Tennessee.

Nature in many ways challenges man in his attempt to make the Tennessee a navigable stream capable of supplementing the other agencies of navigation in a period where speed is a major desideratum. The river is poorly located. It runs transverse to the normal trend of movement of commodities. The trade centers of the Valley are to the north and northeast. The nearest ocean port is Savannah or Mobile. From Knoxville the head of navigation to New Orleans, the natural place of deposit for commerce that moves by water, is 1,800 miles by water but only 600 miles by land.

Muscle Shoals has always been a barrier to river commerce, dividing the waterway into two parts that have never been closely united by canals. The river traverses four physiographic provinces. It runs transverse in some portions of its course to the trend of the topography and the rocks. Numerous shoals and bars must be removed to fit it for modern commerce. More than \$19,000,000 have been spent on the river up to 1930 for navigation improvements. Treating this expenditure as a self liquidating, interest-bearing investment and charging up to navigation costs the annual cost of maintenance also, the public is spending \$2,428,000 to move commerce worth \$2,700,000 and the public's contribution to commerce on the Tennessee is 9.7 cents per ton mile. The boat lines' rate is .8 of a cent per ton mile. The total cost of transportation to the public is 10.5 cents per ton mile. The regular railway rate in the southern division is .89 cents per ton mile. Commerce would need be more than 100 times as great as at present to justify the \$19,000,000 annual expenditure. Instead of investing \$75,000,000 in the Tennessee River, which the new project adopted in 1930 calls for, it is suggested that the money be spent on "heavy duty" roads for heavy truck traffic. This sum would build 1,700 miles of road from Knoxville to New Orleans with a branch to Savannah, one also to Cincinnati and a third to Norfolk or to Washington, D. C.

RODERICK PEATTIE.

Some Political Aspects of Mountains.

Mountains are considered important as natural boundaries. Exceptions to the generalization are of several types. The exception due to physiography is commonly where mountain crest-line and watershed do not coincide. A second type is where political ambitions have transmontane expression. The third type of exception is in the case of "straddle folk." High mountain villages are in an economic sense commonly oriented up mountain. Their interest is shared by villages on the opposite flank. Political government and more commonly vicinal cultures may straddle mountain crests. The Pyrenees are used as an example. Tyrolian culture straddles both alpine flanks and ends on the Italian side near the upper limit of intensive grape culture. What was Sud-Tyrol is included within Italy logically from the strategic side. But by the principles of economic and social geography the Sud-Tyrol belongs to the straddle culture and is an integral part of Tyrol.

ROBT. S. PLATT.

Terrene Occupance in the Maracaibo Basin.

For this reconnaissance study the Maracaibo Basin was traversed from the northwestern to the southeastern margin, and two small areas were selected and given special attention as typical samples of occupance. These two spots represent not only two kinds of occupance now present at different places, but also two stages in a sequence of occupance—one old, the other new.

The first of these is Hatico La Reforma, a small ranch, inland from the lake in the semi-arid, sparsely wooded, undulating, sandy plain. Most of the land is goat pasture, from which bushes have been cleared and in which dividivi trees, the prevalent leguminous growth of the area, have been left standing. The unfenced boundary of the ranch is not well defined, but the central focus is distinct, with its water hole, corral, dwelling house, and fenced field. The cash products of the ranch are goats sold in Maracaibo for their skins, and dividivi pods sold for their content of tannic acid. This hatico landscape is a common one, but elsewhere in the basin there are different kinds of establishments under different circumstances. The lake shore settlements in general are unlike those of the interior. Goats and dividivi are less in evidence than fish and coconuts. Dwellings are clustered together in villages and in many cases are built on piles in the lake, where calm, shallow water gives security from insect pests and other disadvantages of the low overgrown shore. From such aboriginal villages Spanish discoverers named the country Venezuela, little Venice.

The second small area selected for close observation is at Lagunillas, a lake shore village which has witnessed recently a special development of a very different sort, emergence of the greatest oil field in Latin America. Here foreign application of a standardized technique has produced a functional pattern of occupancy befitting the local situation, reflecting conditions at the earth's surface and below and above. The distribution of wells, camps, pipe lines and focal establishments, in the lake and on land, depends upon the location of the oil-bearing structure and upon the division of land and water concessions among three competing companies—one controlling all of the land, another controlling defined areas in the lake, and the third controlling all the rest of the lake.

SIDMAN P. POOLE. (Introduced by Harlan H. Barrows.)

Some Geographical Aspects of the Gaspé Peninsula.

The picturesque Gaspé Peninsula of southeastern Quebec has a pattern of cultural occupancy that exhibits some interesting geographic relationships. Structurally the peninsula is largely an area of folded sedimentaries and metamorphic rocks—the extreme northeasterly tips of the Appalachian ridges. These ridges, rising in the Shickshocks to nearly 4500 feet above sea level, have all been truncated transversely by marine erosion in the Gulf of St. Lawrence. Over the whole peninsula stretches the sombre forest of spruce and balsam, in the clearings of which appear the scattered settlements of the "habitant" fisherfolk.

These clearings with their square white wooden houses, their few small fields of grass and potatoes, their fish stages and their nearby flotillas of sturdy little gasoline fishing boats, are all strung along the rugged north coast between Matane and Gaspé. Occasionally the white wooden spire of a church or the red iron stack of an incinerator varies the aspect of a hamlet. Otherwise, in appearance, in economic activities, and in the characteristics of their sites they are all strikingly alike. First, they are, without exception, built directly on the coast; along the one road of Gaspé and adjacent to the cod fishing waters. Second, every hamlet lies at a stream mouth or on a cove between two towering headlands. Behind gravel or sand bars or rock ledges the fishing craft find shelter. Third, the swift-flowing little rivers have built up deltas and terraces, thus providing flat expanses of deeper soil upon which the cattle are pastured and potatoes are planted around the habitant homes. Fourth, some rivers provide waterpower (as at Madeleine) and all serve as the only entryways to the forest resources of the interior.

From the sea comes the cod—the chief food and usually the only product of cash value. From the forest, never more than a few rods away, comes the wood for house, barn, fence, fish-stage and fishing boat. On the

narrow fringe of cleared land between sea and forest are the homes and from this strip come the potatoes, milk and butter. The Gaspésian life in all material aspects is in close harmony with the environment.

Isolation has left its stamp on the people and the cultural pattern that expresses the adjustments they have made. Each hamlet is cut off from its neighbor by the intervening ridges. Access to the interior has always been confined to a few difficult trails—the forbidding forest checking inland expansion. Winter locks tight for many months the only highway—the St. Lawrence. Gaspé, viewed as a whole, though the first bit of Canada to be discovered, has lagged behind the more vigorous settlements centering around Quebec City and Montreal and likewise behind those of Nova Scotia. Both the internal structure of each Gaspésian hamlet and the outward features of this ribbon of settlement as a whole are seen to be definitely related to individual but similar sites and to their general situation in respect to the world at large.

But it seems likely that this long static balance of life to the environment will soon change. The Perron Boulevard has tended to end the isolation; it has brought the automobile with new products, people and ideas. Already "civilization" as evidenced in the form of tourists, gas pumps, radios and silk stockings, is rapidly making its appearance.

WILLIAM E. POWERS AND C. H. BEHRE, JR. (Introduced by William H. Haas.)

Physiographic History of the Upper Arkansas River Valley and the Royal Gorge, Colorado.

The highest definite physiographic record is furnished by occasional remnants of a fairly general mature but not post-mature erosion surface at about 12,000 feet. This is probably of Miocene age and corresponds to the Rocky Mountain peneplain. In it basins were developed that are now occupied by Tertiary sediments; their mode of origin and exact age are uncertain. This stage of basin filling was probably antedated by the outlining of the present Arkansas drainage and the cutting of the highest surface at present flanking the Royal Gorge. This surface has its counterpart in dissected rock pediments bordering the Sawatch and Mosquito Ranges. Subsequent stages in the physiographic history are marked by widely distributed alluvial terraces and corresponding rock pediments that form a descending flight along the valley sides. The highest of these appears to be Preglacial. Within the Royal Gorge a marked rock terrace records a pause in downward cutting and possibly corresponds to the Preglacial terrace just mentioned. Three subsequent glacial stages and their terraces are now definitely established.

EDWARD C. PROPHET. (Introduced by K. C. McMurry.)

The Recreational Industry in Michigan: A Series of Type Studies.

During the last 20 years recreation has become a major industry in Michigan. It expresses itself in the landscape in numerous ways, some of which are illustrated in the following type studies:

Escanaba, a tourist center. On a continuation of Green Bay, it is the largest city on the south shore of the Upper Peninsula. Tourists traveling around Lake Michigan pass through it and usually make it their stopping point for this part of the trip. Most of the near-by country is not interesting, being made up of badly cut-over and burned-over sandy plains and swamps. The volume of traffic is great, and has led to the development of an unusually large number of tourist lodging houses. Many residents get their entire support from this source.

Munising, a focal point for tourists. On a beautiful bay of Lake Superior, protected by a large island, the area has been called the Naples of America. The Pictured Rocks, 300-foot cliffs of limestone, border Lake Superior at this point. Tourists from the mid-west states travel long distances to visit this scenic area. Many waterfalls add to the interest. The business of serving the tourist has become important and many cottages, rooming houses, and cabins have been constructed.

The "Snows," a resorters paradise. In the southeastern section of the Upper Peninsula an outcrop of relatively hard dolomitic limestone, which dips gently to the southeast, extends obliquely into Lake Huron. This formation has been broken up into large blocks by channels established in late glacial times. The lake has occupied these channels forming a large number of islands which lie in tiers roughly parallel to the mainland. The soil is thin and the area is uniformly covered with birch trees, many of them white birch. This area became a summer resort of the socially prominent people of Michigan and adjoining states about 35 years ago. Its popularity has increased without losing its atmosphere of refinement and seclusiveness. Most of the visitors are resorters and stay for the season. Its physical features make it one of the best resort sites in the State.

The Pigeon River Tract, a forest reserve and game refuge. An area of sharply defined moraines, till plains, and outwash plains. Formerly heavily forested but now cut-over and burned over in large part. About three townships of land now in the State project. Public hunting grounds adjoining the game refuge. Wild land but being put under careful management to bring out its best use as a combination game preserve, forest preserve, hunting land, and wilderness park. An example of the utilization of a large tract of so-called idle or waste land for human enjoyment and maybe a profitable use financially over a period of years. Located off main lines of travel but accessible to visitors seeking the wilds.

These four examples of various phases of the recreational industry do not cover all the ramifications of that business but suggest some of them.

JOHN L. RICH.

The Development of Even-Crested Ridges Without Peneplanation.

An analysis is made of factors which tend to give even crest lines to ridges of the Appalachian type, irrespective of any former peneplanation. The controlling factors are the rate at which débris is shed from the protruding resistant bed, and the size of the average spalls produced. The latter determines the angle of slope from the ridge, and the former its length. Where spall-controlled slopes from two sides meet the crest of the ridge, further lowering is checked while adjoining parts of the ridge crest are brought down to the same condition. Thereafter the lowering tends to remain uniform along the crest. Ridges formed by beds of different thickness or of different materials will have spall slopes of different lengths and different inclinations and will, therefore, attain the even-crested stage at different heights. Such a condition is likely to be wrongly interpreted as evidence of successive peneplanations.

JOHN L. RICH.

Soil Mottlings and Natural Mounds in Northeast Texas as Seen from the Air.

On a flight from Dallas to Texarkana a photographic record was made of the soil mottlings and mounds that are there excellently displayed. The changes in these features as one passes from the prairies on the west over the bunch-brush land to the forest on the east are possibly significant of their origin. Certain of the mottlings are clearly related to the distribution of bunches of brush. The origin of the mounds, so common in the eastern part of the area, is not discernible from the air. Their distribution, as revealed in the photographs, furnishes evidence against some of the theories of origin that have been proposed.

EARL B. SHAW. (Introduced by Clarence F. Jones.)

The Population of the Virgin Islands of the United States..

The Virgin Islands of the United States, three small rugged isles strategically located near the northeast corner of the Caribbean Sea, show marked adjustments to geographic factors in the distribution, composition and decrease of their population.

Nearly one-third of the people, 7,036, are concentrated in the city of St. Thomas, where a good harbor, together with strategic location, provides the basis for the importance of this well-known port. Another third live

in Christiansted and Frederiksted, St. Croix, towns which are largely supported by the agricultural development on the level Tertiary coastal plain of central St. Croix. On this one significant stretch of arable land in the United States' most easterly Caribbean possessions, villages house the Negroes who labor in the cane fields. Here dwell about one-fourth of the Virgins' population. The remainder are scattered sparsely through the rugged Cretaceous uplands which form the major physiographic feature of each island.

The dominant factor accounting for the 91 per cent colored element in the population is the large number of negro slaves which, in colonial days, were brought from the Guinea Coast of Africa to work on the sugar plantations. Many of the white people making up the remaining 9 per cent manage the sugar plantations, occupy government positions or engage in trade; but a large number belong to the French fishing colony of St. Thomas, one of the few pure white groups in the Caribbean region.

A number of factors account for the decline in population from 43,178 to 22,012 in the last century: the sharp decrease in sugar production, the adverse influence of certain political, economic and scientific factors on St. Thomas' shipping, the lack of important manufacturing or of mineral industries, better opportunities offered to workers by other sections of the Caribbean, and finally the ease with which native Virgin Islanders could emigrate to the United States within the last fifteen years. World depression has, temporarily at least, stopped the decline; but with a return of normal conditions it is probable that St. Croix and St. Thomas will lose still more people until a balance is reached between population and resources—a state already attained by St. John.

FRANCIS P. SHEPARD. (Introduced by François E. Matthes.)

American Submarine Canyons.

New methods have made possible accurate detailed surveying of deep water areas out of sight of land. Leadership in this work has been assumed by the United States Coast and Geodetic Survey. Most of the continental slope off western United States has been resurveyed in detail and much of the slope off the east coast. Contour maps based on these recent chartings have revealed the existence of amazing topography rivalling in grandeur the most impressive features on land. The continental slopes are cut by scores of steep sided canyons with walls up to 6,000 feet in height. Most of these canyons may be traced to depths of from 5,000 to 11,000 feet, although a series off southern California terminate in fault troughs at more moderate depths.

The shapes of the canyons are those typical of youthful stream valleys which have been cut into steep slopes on land. Hypotheses suggesting

other modes of origin than stream erosion are opposed by practically all data which have been gathered up to the present time. Since the heads of these canyons are in many places located in areas of active sedimentation, some process must keep them open. Submarine mud flows or other types of marine landslides appear to explain the situation, but tidal currents may be a contributing agency.

These canyons are found along all parts of the continental slopes on both the east and west coast, except where conditions unfavorable to landslides would have allowed them to become filled. Accordingly it is concluded that the continental margins have undergone large vertical movements during the past. It is believed that the uplifts which allowed the canyon cutting were much earlier on the east coast than on the west coast and that the uplifts were of Pleistocene age off southern California.

GUY-HAROLD SMITH.

The Relative Relief of Ohio.

The completion of the topographic survey of the state of Ohio permits a detailed study of relative relief. In this investigation the cartographic technique employing isopleths has been used to express graphically the regional characteristics of the terrain. In the preparation of this map the state was divided into small rectangular areas measuring five minutes on each side. The difference between the highest and lowest points within each area was plotted on the map. These data are presented graphically by drawing free curves for each hundred feet. The resulting diagram may be called an isopleth map of the relative relief of Ohio.

This map reveals a large area in northwestern Ohio where the relief is less than a hundred feet. East of the more dissected area drained by the Miami River this area of low relief extends southward almost to the Ohio. The areas of moderate relief are principally within the Appalachian Plateau, attaining a maximum of over seven hundred feet in a narrow strip along the Ohio River in the southeastern part of the state and in limited areas west of the lower Scioto River. This method of regional analysis of the terrain of Ohio is presented in order that certain characteristic features of the relief may be revealed. It is hoped that this map may lead to the discovery of meaningful correlations between the relief and other phenomena such as the vegetational cover and crop production.

L. DUDLEY STAMP (University of London).

*One Hundred Years of Change in Land Utilization in the British Isles
—The Work of the Land Utilization Survey of Britain.¹*

After two years of preliminary work, the Land Utilization Survey of Britain was started in October, 1930. Its immediate object was the record-

¹ Abstract of an invited paper by the Director of the Survey.

ing of the present use of every acre of land in England, Wales and Scotland, thus creating an historical document which could be used as a standard of comparison with the past and as a basis of planning for the future. The work was carried out on the base maps on the scale of six inches to one mile published by the Ordnance Survey and on which field boundaries are shown. There are about 22,000 of these sheets and the initial task was to secure volunteers as far as possible each to cover the home area. Especial emphasis was laid on the need for completion within a short space of time and the volunteers were drawn mainly from schools, colleges and universities, the work being done as an educational exercise. In about two-thirds of the counties the County Director of Education acted as local organizer. Most of England was covered in 1931-32, Wales in 1932-33, Scotland in 1932-33 and by the close of 1933 roughly three-quarters of Britain had been surveyed. The field sheets are being edited and the results reduced to the scale of one inch to one mile. Sheets on this scale are being published at a price of 4s. (\$1) each—also folded and mounted—eight being already issued and twelve in the press. This first series of twenty will be representative of most types of country found in Britain. The continuance of publication depends on public demand for the maps. The Survey is an independent organization under the auspices of the London School of Economics (University of London), but the classification of land was drawn up after consultation with official and unofficial bodies representing owners and users of land—agriculturalists, foresters, land planners, realtors and others. In brief it is:

Forest and woodland (Letter symbol F, color dark green) separated into Fa (merchantable timber and plantations), Fb (for supply of fence posts and small material), Fc (scrub, uneconomic), Fd (cut-over). These distinctions are made on the 6-inch maps and the type of tree (coniferous, hardwood, mixed) is also shown.

Meadowland and permanent grass (M, light green).

Arable or cropped land, including fallow and grass grown in rotation with crops (A, brown). Crops have been recorded in many areas.

Heathland, moorland and rough pasture (H, yellow), usually separable by position into hilly rough pasture and rough marsh pasture.

Gardens and lots surrounding houses commonly used for the production of limited but important quantities of vegetables and fruit (G, purple). Orchards are shown in the same color but with a tree symbol.

Land agriculturally unproductive, either covered with buildings or waste, the two separately shown (W, red).

A comparison of the results of the Survey with past conditions has been made possible by the existence of manuscript records of land use in many

parts of Britain, 1839-41—collected in connection with certain changes in taxation. The work of comparison, field by field, is very slow and laborious but much light is thrown on the factors causing changes in land utilization. According to official figures, first collected in 1871, there has been an almost continuous decline in the acreage of cropped land from that date to the present day (14,766,000 acres in England and Wales in 1871-75 to 9,362,000 in 1932, and comparable figures in Scotland). This has been offset to a large extent by the increase in the acreage under permanent grass (reaching 15,837,000 acres in England and Wales in 1932). Rural depopulation has been accompanied also, however, in the poorer lands by a definite if small abandonment of formerly improved land. The general trend is a reflection of economic factors, but the survey shows the remarkable and growing importance of geographical factors in determining the actual areas of change. In areas which have so far been studied in detail,² there has been on good soils, relative stability, even occasional increases in cropped land, on heavy soils cropped land has given place to grass and consequent dairy farming or animal husbandry: areas which formerly *had* to grow grain for the subsistence of local inhabitants have been released from that necessity by improvements in transport and the settlement of overseas areas from which large supplies became readily available. Such areas have passed to a type of utilization—good quality grassland—more consistent with the natural geographical conditions of soil and climate.

FLOYD A. STILGENBAUER. (Introduced by K. C. McMurry.)

A New Population Map of Middle America.

"A New Population Map of Middle America" is constructed after the same methods used in the construction of "A New Population Map of the United States" published by Rand McNally & Company in 1932. All population groups over 2,500 as near as could be determined from the Latin American scheme of agglomeration are mapped as urban centers with similar circles or dots in proportion to the size of the groups. From 2,500 to 15,000 the circles are solid black dots, and above 15,000 hollow shaded circles are employed. Groups below 2,500 are mapped as rural with the unit dot in solid black equal to 2,000 people.

The Middle America map comprises all the lands of the Western Hemisphere between 6° N. and 34° N. latitudes. United States, south of a line from Cape Hatteras to San Diego; Mexico; Central American States, Northern Colombia, Venezuela, and British Guiana; Trinidad, Bahama Islands, the Greater Antilles and the Lesser Antilles are included.

² See E. C. Willatts (Secretary of the Survey) in *Geographical Journal*, December, 1933.

Enlarged insets of all the important islands of the Caribbean and densely populated states are included in order to clarify the population picture.

This cartographic work is a first attempt in the construction of a detailed population map of Middle America in its entirety, with the use of a proportionate scale and the 1930 or later population figures and estimates. The author encountered many technical difficulties of construction and compilation which were surmounted with the aid of the many government offices in the cities of Detroit, Washington, and foreign capitols. A practical, teachable map showing distribution, density, and agglomeration relationships was the final outcome of our labors over a two-year period. The map can be further improved through suggestions from those who use it, and who have made detailed studies of the smaller geographic regions within its scope.

GLENN T. TREWARTHA.

Japanese Cities: Morphology and Distribution.

Throughout the greater part of its history Japan has been emphatically a nation of farmers and rural dwellers. Even at the close of the 19th century there were only 78 cities whose population exceeded 20,000. In 1930 there were 73 cities in Japan proper with populations of 50,000 and greater. They are emphatically concentrated in sub-tropical southwestern Japan, and a large majority have tide-water locations on flattish delta-plains. Most of the early Japanese cities had their origins as castle-towns, the political-economic centers of semi-independent feudal empires.

Two great classes of Japanese cities may be recognized: (1) the six great national cities (Tokyo, Osaka, Nagoya, Kobe, Kyoto and Yokohama) with more than local hinterlands, whose populations are each in excess of 600,000, and where there is a definite foreign imprint especially throughout the commercial and industrial portions; (2) in contrast to these stand the scores of other cities (only three exceed 200,000 in population) which are essentially Japanese in their features and very much resemble each other except in the matter of size.

STEPHEN S. VISHER.

International Boundaries: A Classification and Evaluation.

International boundaries have a social significance which abundantly justifies their being studied from the broad viewpoint of geography. The conclusions arrived at a generation or two ago by militarists have been widely accepted but appear to be inadequate or erroneous. International boundaries may be classified in various ways: (1) as to physical type, (2) as barriers, (3) as to population-density passed through, (4) as to the distinctiveness of the people separated by the boundary, (5) as to geographic

distinctiveness, (6) as to historical permanence, and (7) as to their prospective permanence.

Each of the types of boundaries may be considered from several points of view, for example, from that of the surveyor, the militarist, the nationalist, the commercialist, the eugenicist, the internationalist.

A consideration of the various types of boundaries from these various points of view leads to the conclusion that the best kind of international boundary today is the kind that has generally been considered to be the poorest, to wit, the arbitrary line located by agreement and artificially demarked. If it runs through sparsely settled areas which have little human interest, such a line is the best kind, because it is most easily demarked, the most definite, and the most permanent. If, on the other hand, it runs through densely peopled regions it is also the best as the most precise and most favorable to a free exchange of goods and ideas. This ready exchange of goods and ideas works toward making the people of both sides of the line similar in welfare and ideals. In so far as this is accomplished, international friction is decreased, and the prospective permanence of the boundary is increased.

R. H. WHITBECK.

Unhappy Puerto Rico.

Notwithstanding the truly marvelous progress that Puerto Rico has made under United States control, a considerable part of the insular population is dissatisfied and critical of that control. Sugar has become the all-important industry, and this industry is dominated by American capital. In times of prosperity, profits on sugar are high but wages are low, employment is seasonal, and the working class is undernourished. The Island is seriously overpopulated. Three-fourths of the land is mountainous or hilly, yet the density of population is 450 to the square mile. In spite of an excellent school system, excellent road system, almost complete self-government, and a helpful attitude on the part of the United States, there is agitation for complete autonomy, and one small party even demands independence.

A high proportion of the people suffer from hookworm, malaria, or tuberculosis, making an extremely serious health problem. The Island treasury and the municipal treasuries are unable adequately to finance the services that the Island needs. Practically all of the offices are occupied by Puerto Ricans, yet the small number of key positions filled by appointment cause certain Puerto Ricans dissatisfaction, for they desire to have all offices under the control of the Insular population. The terrible hurricanes which sweep the Island have destroyed \$150,000,000 worth of property since the United States took possession. The widespread poverty, disease, and undernourishment, and the rapidly increasing population make the Puerto Rican prob-

lem the most serious which the American government has to face in any of its outlying territories, and no solution which has been offered promises to remedy the unhappy situation.

DERWENT WHITTLESEY.

Some Landscape Expressions of Effective Central Authority.

Central authority (by which is meant a sovereignty extensive enough to comprise a good many economic units over which it exercises effective control) places its stamp upon the landscape no less than agriculture or transportation.

Many of these landscape expressions spring from the security which effective central authority affords. Wherever the economic life is best served by scattered habitations, they are found. Defense points are abandoned for open plain. Walled cities burst their bounds, rebuild their streets, and spread out into surrounding countryside. Expansiveness does not accompany security along international boundaries. There the landscape is congested with features intended to maintain security. Boundary displacements are followed by political acts which directly or indirectly modify the landscape.

Central authority, acting for the whole of its territory in specified matters, tends to produce uniformity in landscape features, such as public buildings. A uniform land survey, including routes, is superposed on the landscape in many new countries (*i.e.*, those created in a period of effective central authority). The expenditure in backward or pioneer areas of money collected in prosperous sections is another common activity of central authority which modifies the landscape. Roads, schools, irrigation works, state forests and other preserves are among the items commonly affected. In undertakings which involve more than one region, central authority may be the only agency which can put through desirable improvements, even though the several regions are prosperous. Flood control, national route systems, navigation, and power installations are examples. The power to redistribute funds among the sections of a state may lead to abuse, especially when vested interest prolongs the life of institutions no longer serving the needs of the people. Expenditure on the seat of government is tempting, and has more than once contributed to the overthrow of unduly lavish states. Outside the capital the same tendency to erect expensive buildings may be observed. Often public buildings are inappropriately placed, the misfit being made possible by the monopoly character of the functions.

Laws may be persistent modifiers of the landscape, although their effect is likely to be indirect. Many of the alterations which result are not contemplated when the law is passed, and the incidence of the changes is likely to obey the rules of economic, rather than political, geography. Tariffs,

embargoes, laws to govern homesteading of new countries, and blanket codes transferred from one environmental complex to another, are among the laws which most pronouncedly modify the landscape.

BAILEY WILLIS.

Inselbergs.

Bornhardt, a German explorer of East Africa, described as *Inselberge* certain peculiar residual hills, which are typically developed in the piedmont region of southeastern Tanganyika Territory. This article deals with the conditions of their origin, recognizes their occurrence in various parts of the world, and proposes that the term *inselberg* be adopted as a name for all residual hills of that species. The English plural is conveniently formed in lieu of the German.

Special emphasis is laid upon the important rôle played by secular disintegration of gneisses and schists in contrast to the persistence of aplitic and quartzose granite and gneiss, in the development of true *inselbergs*.

ELLA M. WILSON. (Introduced by Mark Jefferson.)

Zagazig—A Cotton Market.

Zagazig, north-east of Cairo, is one of the important cotton markets of Egypt. Its situation at the junction of the Tanitic distributary and the Wadi Toumilat depression have made it in turn a caravan, a canal, and a railroad center. In addition to its favorable transportation facilities, its importance as a market has been enhanced by a progressive foreign colony which furnished capital and experience necessary for successful business enterprises. In the eastern delta, the fellaheen look to Zagazig for their supply of seed and fertilizer, for facilities to gin, bale, and ship their cotton, and indirectly for credit to produce the crop and buy their few luxuries until the yearly pay day comes.

ALFRED J. WRIGHT. (Introduced by Guy-Harold Smith.)

Industrial Structure of the Miami Valley.

Whereas many of the villages and towns of the Miami Valley reflect an obvious maturing of economic regionalism, for the region as a whole the manifestations of this functional phenomenon have been much more complex, although none the less tangible.

In the periphery, areal limitations have usually taken the form of local industrial relicts, but for the industrial core of the Valley it is manifested in the forces which have profoundly modified the manufacturing structure.

Increments of growth are still due to the forces governing the early growth of the Valley: centrifugal forces emanating from Cincinnati and Dayton; centripetal forces operating principally where the Valley corridor has been crossed by or has absorbed major east-west trade routes; and finally the continued and intensified agricultural occupation of the area.

More detailed examination, however, reveals certain qualities of manufacturing not to be associated with the formative stage of the industrial structure. Specialization within the machinery field has emphasized environmental differences quite as definitely as a change in the classes of products.

FRANK J. WRIGHT.

Post-Harrisburg Drainage Changes in the Upper Roanoke and James River Basins in Virginia.

Erosion surfaces were produced during the Harrisburg cycle on the limestones and shales of the Appalachian Valley. These surfaces normally rose upstream, and consequently the elevations in nearby basins were variable. The uplift which introduced the present cycle, stimulated the headward growth of certain streams and enabled them to capture drainage territory from neighboring streams which were flowing at higher levels.

The Harrisburg divide between Roanoke and New Rivers was located near the eastern end of the Pedlar Hills, at the present junction of North and South Forks of Roanoke River. Since the close of the former cycle, the divide has shifted westward toward the higher New River basin, and an area of about two hundred square miles has been transferred from the New to the Roanoke. The upper surface, 2,200 feet above tide, slopes westward toward the New, while the lower surface, approximately 1,500 feet in elevation, slopes eastward in the direction of flow of Roanoke River. A ragged, eastward-facing escarpment, more than 600 feet high, separates these Harrisburg surfaces.

In the region between Buchanan and Lexington, Virginia, there are two Harrisburg surfaces, a lower which slopes down the James, and an upper which rises from Buchanan toward the north along the old Plank Road. The latter was developed by a subsequent tributary of the James which rose near Highbridge Church and flowed southwestward along the Plank Road toward Buchanan. From this old divide near Highbridge Church another subsequent stream discharged toward the northeast to join the ancestral Cedar Creek whose course led eastward from the Short Hills across the Valley and Sallings Mountain.

Since the uplift which closed the Harrisburg cycle, short tributaries of the James have eaten back into the escarpment, separating the upper and lower levels, and abstracted parts of the higher basin. In this work they have apparently been aided by sink-hole drainage. In some such way Cedar Creek has been diverted from its former course across Sallings Mountain to its present position under Natural Bridge. Roaring Run, Rocky Run, and other small streams are also pirates which have participated in the dismemberment of the earlier drainage system.

